HEALTH CULTURE

AND

The Sanitary Woollen System.

G. JAEGER, M.D.

"The first Wealth is Health."

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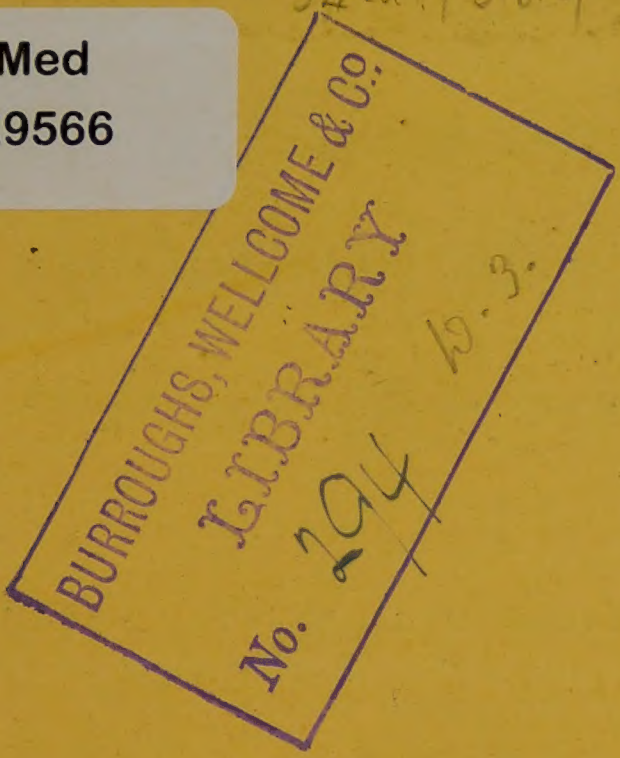

SELECTIONS FROM ESSAYS ON

HEALTH-CULTURE

And the Sanitary Woollen System.

BY

GUSTAV JAEGER, M.D., STUTTGART,

PROFESSOR OF ZOOLOGY AND PHYSIOLOGY.

(TRANSLATED FROM THE GERMAN.)

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PREFACE.

THE scientific and technical discussion of my researches in the direction of Health-culture will be found in works previously published by me on allied topics, such as *Die menschliche Arbeitskraft* (Munich : R. Oldenbourg, 1878), *Seuchenfestigkeit und Konstitutionskraft* (Leipzig : Ernst Günther, 1878), and *Die Entdeckung der Seele* (Leipzig : Ernst Günther, 1880). In writing the essays contained in this volume, I have aimed at the practical application and diffusion of my views, and have consequently striven to adopt the plainest mode of popular exposition. Next to the soundness of my sanitary proposals—which, indeed, will speak for themselves upon a first trial—I am chiefly indebted to my popular compositions for the extraordinary rapidity, assuredly unsurpassed in its way, with which the Sanitary Woollen system has borne down every obstruction in its path.

I am anxious here to caution my readers beforehand against erroneous impressions with respect to

the Sanitary Woollen System. Dress has hitherto been generally regarded merely as a means of protection to the body. This restriction is correct when clothing is manufactured partly from vegetable and partly from animal fibres; but it falls altogether short of the whole truth, when entertained in relation to the Sanitary Woollen Clothing. The latter supplies a decidedly more perfect and effectual protection than is afforded by ordinary "mixed" clothing; it has, however, besides, the most important effect of rendering the body *hardy*. This operation is gradual but certain. The wearer is not at once made proof against influences of weather, infection, etc.; various disturbances to health may occur, but their short duration will be proof that the right course has been taken to secure "a sound mind in a sound body."

Perceiving the difficulty of inducing any important section of the public to adopt a reformed System of clothing, unless practically assisted by a provision of garments made in accordance with my System, I arranged for this to be done under my control.

With the experience obtained of the sophistication of woollen fabrics by the admixture of cotton, and in view of the unreadiness with which manufacturers and tradesmen at first took up the matter,

I feel satisfied that by adopting this practical course I greatly assisted the extension of the reform. In the Sanitary Woollen System, woollen fabrics adulterated by the addition of vegetable fibre bear to the genuine article an analogous relation to that which wine tainted with fusel oil bears to pure wine, because the cotton threads fix and retain the "noxious" emanations corresponding to the vapours of fusel oil. If, therefore, for the sake of a possible saving in price or on the score of convenience, people are induced to deal in doubtful quarters and to forego the advantage of thorough investigation, I beg that any untoward experience may not be laid to the charge of the System.

G. JAEGER.

STUTTGART.

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SELECTIONS FROM ESSAYS ON

HEALTH-CULTURE,

AND THE SANITARY WOOLLEN SYSTEM.

EFFECTS OF EXCESS OF FAT AND WATER IN THE TISSUES.

(1878.)

THE English word "condition" is the only adequate term wherewith to express that state of mind and body in which the health and working power leave nothing to be desired. Let us first see what constitutes "condition." Briefly stated, it depends upon the correct proportion of the most important bodily constituents, and upon certain physical properties of the living tissues.

As regards a correct proportion of the bodily constituents, we may limit our inquiry to an examination as to three of these—albumen, fat, and water. The first is the foundation of muscle, nerve, blood, etc., and, in fact, sustains the existence of the body. Relatively to this substance, water and fat may be viewed simply as auxiliaries, although indispensable in themselves. A proper condition of the body requires that these three constituents shall be present in certain proportions, while the richer the body is

in albumen the sounder it will be and the fitter for work; on the other hand, any excess of water or of fat will lessen its energies and its power of repelling the action of influences likely to promote disease.

Touching the physical properties, we have first to consider the degree of excitability of the life conductors of the body, chief among which are the nerves and the muscles ; for upon this quality depend energy, speed, and power of excitability in bodily and mental work, as well as in those processes of adjustment which sustain the body against external disturbing influences. The second point relates to the conditions of elasticity in the sinews, ligaments, vessels, lung tissues, etc. Any diminution in their flexibility and firmness lessens the energy and the power of resistance of the body.

Imperfect action of the skin will induce, with varying rapidity, certain changes in the proportions of the constituents and in the physical properties of the substance of the body.

These changes must be considered separately.

Foremost I place the increase of the store of fat, which almost invariably supervenes in cases of sedentary habits of life, when there is no want of food. The injurious effects of an accumulation of fat are as follows :—

Careful experiments have established that fat people possess considerably less blood than the lean, and it is consequently a mistake to suppose that obese people are necessarily full-blooded. On the contrary, they are poor-blooded, which in itself is a malady made manifest by a never-ending series of minor disorders of the general economy ; and there are a variety of diseases to which fat people fall a prey

and succumb much sooner than the lean, notably all those which are determined by the quantity of blood in the system. With reference to vital energy, it is notorious that persons suffering from poorness of blood are incapable of doing the same amount of work as those who possess a full measure of blood, because the working power of an organ depends upon the store of blood in it. Another drawback of obesity is that the fat diminishes the necessary space for the circulation of the blood and the play of the respiratory organs. The first of these evils brings about an abnormal distribution of the blood in the system, which is less apparent if the body be resting, but shows itself as soon as the circulation quickens, when the rapid flushing of the face indicates an excessive rush of blood to the head, which may produce dizziness or apoplexy. Another irregularity in the distribution of blood is, that its return from the lower parts of the body towards the heart is hindered by the reduction of the space in the abdominal cavity. This causes heaviness and lassitude in the legs, and a tendency to the formation of varicose veins ; while, if the circulation of water in the system be impeded, there will ensue dropsical swelling of the legs. The obstruction of the return of the blood from the abdominal organs causes the extremely troublesome, and in their latter stages of development even dangerous, hemorrhoidal complaints which almost invariably afflict the obese. A hampered circulation is also one of the reasons why fat people are less capable of work than the lean. If an organ be required to do work, it needs 80 per cent. more blood than when at rest. Every labour therefore necessitates an alteration in the distribution of the blood, to which fat

operates as a hindrance, blocking the way so that the blood cannot flow in sufficient quantity to the part that requires it.

The limitation of space due to fat is also mischievous from its interference with the free play of the lungs. On this point I myself took measurements, which went to show that, among men of forty years of age, the obese could only empty a breathing measure to the extent of 18 cubic centimetres of air to every kilogramme of weight of body, after taking in the longest possible breath, while the lean would inhale 40 to 50 cubic centimetres, or about three times as much. It follows that the obese are disabled from exceptional exertion necessitating fuller breathing than usual, and a more copious flow of blood through the lungs, which latter have not sufficient space either for the air or the blood. The obstruction caused by fat is shown in the rapidity with which an obese person becomes heated by exertion ; but even in repose this interference with the free play of the respiratory apparatus is injurious, and renders the body sluggish, because it checks the excretion and combustion of the substances (carbonic acid, water, and lactic acid) which hinder the proper functional processes of the body.

With regard to the greater liability in cases of obesity to attacks of disease, I may particularly refer to the danger of pulmonary affections. If any such malady render one portion of the lungs unserviceable, life will be further shortened by the reduced working capacity of the remnant which may be still available for use. Fat people are also far more susceptible to such maladies as gout, dropsy, emphysematous lesions, etc.

The effect of fatty deposits upon the physical properties of the living tissues, and especially upon the measure of their activity, may be easily verified by experiments. If a nerve be severed in a living animal, so that the brain can no longer transmit its action, and is thus reduced to a condition of rest, globules of fatty matter will be gradually deposited, and in proportion as this proceeds, the active faculty of the brain will decrease. A similar change affects the muscles when their nerves have been cut. Their power of contraction and the energy of the contractions diminish in the same ratio as the granules of fat increase in number and size. Since, therefore, the measure of excitability in nerve and muscle governs the power and energy, not only of bodily, but also of mental work, it will be easily understood why corpulent persons become inert and limp both in body and mind. As regards the mind, I may add that fatty degeneration of the brain is one of the most frequent causes of imbecility and mental aberration.

From the foregoing it will be seen that any one wishing to preserve health and working capacity, should keep strict watch whether any deposit of fat is going on in the body. Such symptoms must be taken as a *memento mori*, evidencing a wrong system of living, and in order to stay the further accumulation of fat, and to get rid of what is superfluous, recourse must be had to increased action of the skin. There is no better remedy. Against the well-known BANTING cure, consisting in abstinence as much as possible from fatty or farinaceous food, I would caution all persons with whom the deposit of fat has attained any considerable proportions, because under such circumstances it may become dangerous ; and even

though it bring no peril with it in particular cases, the efficacy of the BANTING cure is indefinitely inferior to the agency of an active skin in the restoration of a healthy condition to mind and body.

An inordinate increase of the percentage of water is not so apparent as the deposit of fatty matter—if the two morbid conditions do not manifest themselves concurrently, which is mostly the case—but it makes itself distinctly felt ; the flesh is flabby, like dough, whereas under normal conditions it should be perfectly elastic and firm. Accumulation of water in the system directly tends to increase the percentage of water in the blood, which means poorness of blood, and a consequent lowering of the powers in all parts of the body ; for their nutrition is lessened, and the water in them increases, crippling the vital forces, or, in other words, diminishing the normal activity of nerve and muscle, and eventually suspending it altogether.

This is shown on the one hand by the phenomena attendant on dropsy proper, and on the other I had evidence of it in an experiment tried upon myself and a few thoroughly healthy subjects, among whom were two of our local medical men. In this experiment I endeavoured to determine by figures how far the loss of water in the tissues, caused by the action of a Turkish bath, would affect the speed of nerve transmission, not only in the sensory and motor nerves, but also in the cranial nerves. The experiment was conducted in the following manner :—

For investigations of this kind a stop-watch is used, the index-hand of which, by simple pressure exerted upon two separate knobs, can either be brought to a

standstill or again re-connected with the clock-work, which continues to run ; and the stop-watch is so constructed as to record the two-thousandth part of a second. The operator holds the knob that sets the index-hand in motion, while upon the stoppage-knob rests the finger of the person undergoing the test. At the commencement of the trial the index-hand stands still, and its position is noted. Immediately the operator starts the index-hand, by pressing the knob under his control, the other person must arrest it by pressing the second knob. The difference between the two readings or positions of the index will then accurately indicate, on a scale of one two-thousandth part of a second, the time needed by the above excitation to run its course through the eye, the optic nerves, the brain, the nerves of the arm, and finally reach the muscles actuating the finger that presses against the knob. I made another experiment. The stop-watch was connected with an electric bell, which intimated to the subject of the test the starting of the index-hand. This gave the time of transmission of the nervous impulse from the ear to the finger. Thirdly, to test the activity of the brain, two bells were connected with the clock-work, one on the right hand and the other on the left of the subject of the test, in each of whose hands was placed a knob to stop the index with. The operator held in his grasp two other knobs, enabling him to ring the bell on either side at will, when the index-hand was set going. The subject of the test was required to press the knobs right or left, accordingly as the bell rang right or left. The intervals of time, as ascertained in this last trial, were constantly longer than those recorded in the second experiment.

when only one bell had been used ; and the deduction of the interval of time involved in the second experiment from that required in the third experiment will give the duration of the psychical operation upon which depends the act of discrimination between right and left. Of course such tests need repetition at least half a dozen times, and the average will give the result. In the series of experiments above described, the tests were applied in the afternoon of the day previous to the persons taking a Turkish bath, and repeated the following day at the same hour, but after a Turkish bath taken in the morning. In each case there was increased rapidity of action, the average amounting to 13 per cent. This is the numerical expression of an important enhancement in the capacity of the nervous and mental energy.

It is interesting to note that muscular power does not undergo change as a consequence of the effect of a Turkish bath. This I ascertained by noting the length of time during which a forty-five pound weight could be held up with the arm bent at right angles.

Before I had instituted these stop-watch experiments, I had become aware, in the following manner, of the great influence exercised by the proportion of water in the body upon the working powers of the mind. Towards the end of last winter, and, without signs of any particular sickening, I experienced so notable a diminution of my working capacity, while engaged in the preparation of a book on *The Working Power of Man*, that I could at most accomplish eight manuscript pages a day, while I found I required a very unusual amount of sleep. Contemporaneously with this, I had increased in girth very

considerably. At the time it occurred to me that the cause of this diminished capacity for work might be attributable to increase, not only in the accumulation of fatty matter, but of water as well, and I resolved to seek a remedy, commencing with a few Turkish baths, and continuing with a regular course of exercise. Ere I reached the latter stage of my training, my capacity for mental work had so far improved, after five Turkish baths, that I could finish nearly double the amount of manuscript in the course of the day.

In considering how far an increased percentage of water in the system intensifies the liability to sickness, the fact may be instanced that decay sets in much sooner after death in dropsical cases than in others, showing that an excess of water accelerates the decomposition of the bodily substance. To this may be added that when the blood is watery, and therefore in a more fluid state, injurious irregularities in its distribution are facilitated ; and I would, at least partly, ascribe sensitiveness to so-called colds and chills to an excess of water in the system, upon the following grounds :—From the teachers' attendance books at the two Stuttgart High Schools, I made a note of all cases of non-attendance in the first class, taking the totals for the winter months from the year 1857 down to 1874, and the figures are : For October, 159 ; November, 532 ; December, 391 (but considering the Christmas holidays, a corrected estimate should bring it up to at least 500) ; January, 682 ; February, 896 ; and March, 730. As non-attendances at school are mainly referable to chest affections, colds, and similar complaints, these figures show that liability to colds in the course of the winter

gradually intensifies, and reaches its highest point towards the end of the season. In winter time there are a variety of circumstances likely to operate in increasing the percentage of water in the system; there is less bodily exercise; the thicker clothing is less pervious to the water given off from the skin; the indoor life in the stagnant atmosphere of rooms arrests evaporation; and there is little or no perspiration. This and other inquiries have led me to the conclusion that predisposition to colds and chills is due to excess of water in the system, and that the term to "harden" the body is very expressive. The bodily substance must be made *hard* by draining from it the superfluous water, if it is to effectually resist the exciting causes of colds and chills. I have had an instrument constructed, which will enable me to verify statistically, and by actual experiment with living persons, whether my surmise on this head is correct.* In addition to the change in the due proportions of the bodily constituents just described, there supervenes a change in their physical constitution. The most vital of physical properties is the excitability of nerve and muscle. Upon this depend the rapidity of bodily and mental labour, the efficiency of the organs of sense, and the activity of all the bodily functions in relation to change of substance, and the phenomena of motion. We have already seen that the energy of the bodily tissues is lessened by the lodgment of water and fat, which is the direct consequence of a sedentary life, because the greater part of the body remains inert. That disuse blunts the measure of excitability, or the faculty of responding to a stimulus, is

* See "The Specific Gravity of the Body," page 27.

shown in cases of severed nerves and paralyzed muscles.

Another physical property impaired and changed for the worse by insufficient action of the skin, is the elasticity of those parts of the body which are moved by the nerves and the muscles. The effect on the working capacity shows itself in the shape of stiffness, which is very noticeable in animals kept too long in the stable. But a greater evil is the loss of elasticity in the blood-vessels and the lungs, diminishing the capacity for work and the power to withstand the causes of disease. Just as from long disuse a gutta-percha hose will lose its elasticity, turn hard, and become brittle, so also will fare the blood-vessels if their activity be not maintained by the free exhalation of the skin. They can no longer adequately respond to the varying necessities of the blood distribution, required to protect against the causes of disease, or called for by changes in the employment of the body ; and if in the end the vessels become so as easily to break, predisposition to apoplexy is established. Diminished functional activity of the vascular system, and of the lungs, moreover, is mischievous in its effects upon the proportions of the constituents of the body. There is lessened activity in the interchange and restoration of matter, leading to the accumulation of water and fat, in the elimination of which the above-named organs of the body play a very important part.

UNDERVESTS.

(1878.)

I AM asked to express my opinion of the well-known network undervests, because it appears that in many quarters these undervests are highly spoken of, and are recommended in preference to the Sanitary Woollen shirt.

The two articles of clothing can hardly be compared. The network undervests are intended to be used only as *undervests*, and their action will greatly depend upon the material of the shirt which is worn over them; whereas the Sanitary Woollen shirts should be used alone, and this important difference must be taken into account in pronouncing judgment.

The case stands thus :—

If a linen or cotton shirt be worn with an undervest, the network is preferable to a flannel undervest. But if it be asked whether linen or cotton shirts, with the network underneath, should be worn, or the Sanitary Woollen shirt *by itself*, without other outer covering than the coat, unquestionably the decision must be given in favour of the latter arrangement.

This opinion is founded upon a careful consideration of the services which the clothing should render to the body. Firstly, it is required to keep the skin uniformly warm; secondly, to offer a free outlet for cutaneous evaporation, which mainly consists of watery vapour; thirdly, gently to titillate and rub the skin, in order to maintain a constant and ample blood supply; fourthly, to assist, instead of hinder-

ing, the self-cleansing process of the skin, which consists in the shedding of the outer cuticle.

We will now compare how far the methods of clothing in question satisfy these requirements.

1. Should a network, or a flannel undervest be worn, underneath a linen or cotton shirt? As regards the first requirement, the maintenance of uniform warmth, there is hardly any difference; but as to the second, the escape of the cutaneous evaporation, the network decidedly offers less hindrance. The air under the clothing can circulate outwards and upwards more freely than when a flannel undervest is worn, as not only are the open spaces of the network much greater than the interstices of the flannel, but they are also too large to become blocked by the excretions from the skin. In relation to the third point there is no material difference, since the knots of the network and the minute hairs of the flannel supply the necessary stimulus for the skin. With regard to the fourth requirement, I should say that the network is preferable to flannel undervests, because the latter soon turn sticky and greasy from the above-mentioned condensation of the cutaneous evaporation into water, causing the epidermal scales, which, when the skin is dry, drop, or are easily rubbed off, to adhere to the body.

2. Which is better, the Sanitary Woollen shirt alone, or a linen or cotton shirt with a network undervest? In relation to the first of the above-named requirements, the maintenance of warmth of the skin, linen and cotton are much readier heat conductors. As touching the second point, and this is the most important, the single woollen shirt deserves the preference. It is not the network undervest, but

the white outer shirt which prevents the escape of cutaneous evaporation, on account of its close web and of the vegetable nature of the fibre (and both these objections apply to linen with even greater force than to cotton) ; again, the starching of the white shirt front renders it practically impermeable to watery vapour, at the very spot where the evaporation could most easily proceed—that is, at the chest and neck.

Hence, the superiority of the Sanitary Woollen shirt in respect of the last of the four above-named requirements, is clear. By dispensing with the practically impermeable white shirt, the cutaneous vapour is no longer condensed, and the skin keeps dry, so that the scales readily come away ; while the countless fine hairy points of the wool will conduce to the cleansing of the skin far more comprehensively than the much fewer and too coarse knots or links of the network.

THE CAUSES OF DISEASE, AND DISEASE GERMS.

(1878.)

I HAVE for some time studied the question indicated in the heading of the present paper, particularly with a view to ascertain the cause of the liability of the human body to disease, and the means by which it may be steeled to effectually withstand external unhealthy influences. In professional parlance this power of resistance goes by the name of "immunity," and in the following remarks I shall make occasional use of this word in the above sense.

My inducement to revert to these studies is a remarkable coincidence between the latest outcome of my researches and the investigations prosecuted by Professor NAEGELI, the Munich botanist, on the subject of the most important group of the external causes of disease—namely, the poisons of infection—on which he has published a book entitled *Die niederen Pilze in ihrer Beziehung zu den Infektionskrankheiten.**

I will begin with an account of my own discoveries, to be followed by an exposition of those of Professor NAEGELI. My attention has for years been especially directed to that particular change in the condition of the body which is popularly called training, or hardening. The problems for solution were as follows :—Wherein does this change consist, what are its causes, and what its uses? Professional works supply but scanty information on these points.

The first result of my studies was, that in the process of hardening the body I recognised such a change in the relative proportions of the three most important constituent parts of the tissues—albumen, fat, and water—as clearly pointed to the conclusion that the hardening is mainly brought about by the elimination of fat and water. I also contrived to obtain, by taking the specific weight of the body, numerical values expressing in figures the hitherto undefined notion embodied in the term "hardened," or "in good condition." As water and fat are lighter substances than albumen, it follows that a man in good training must be specifically heavier than one

* *The Subordinate Fungi or Germs in their relation to Infectious Diseases.*

in a weaker condition, and this has been determined beyond doubt by measurement and weight.*

Another outcome of my studies was a clearer perception of the circumstances favouring the process of hardening the body. The misconception that this consists in simply inuring the body to cold has wrought much evil among the general public. I have succeeded in determining that a system of clothing which admits of the free escape of the watery vapour given off by the skin tends to harden the body, while clothing likely to check the elimination of water from the tissues is enervating.

The process of hardening the body consists in the gain of firmer and more compact flesh, richer in albumen, and with less fat and water. I believe it to admit of no further doubt that this is synonymous with an increase of the power of the body to withstand the action of morbific influences, and that, consequently, the current conception of florid exuberant health is altogether erroneous. The healthiest people are endowed with tough, wiry, firm-fleshed, and well-knit frames, and such subjects withstand much better not only climatic changes, but also those inflammatory affections which are engendered by the intrusion of living disease germs into the human body.

Shortly before I had thoroughly possessed myself of these facts, there appeared the above-named work by Professor NAEGELI, containing disclosures so noteworthy on the subject of the so-called infectious diseases, that I at once formed the design of communicating some of its leading features to my readers, without, however, then suspecting into

* See "The Specific Gravity of the Body," page 27.

what intimate connection NAEGELI'S researches might come with my own.

To Professor PETTENKOFER, of Munich, pertains the merit of the discovery that the germs of infection in cholera anid typhus (nervous fever) find a dwelling-place in the underground water passages into which wells are sunk ; that in such localities they will not only exist, but multiply ; and that from this base of operations they carry out the work of infection by finding ways to reach the human body. He was the first to promulgate the fact, since extensively confirmed by others, that the risk of infection increases when the level of underground water is lowered, and conversely that the danger diminishes as the water rises. This harmonizes with the fact that intermittent fever, which is generated in marshy surfaces, makes its appearance with augmented frequency when the sinking of the water level lays bare more extended tracts of marshy surface, thus allowing the unquestionably animate germs to rise in the air.

On this so-called underground water theory of PETTENKOFER'S, NAEGELI grafts his observations. From a series of experiments carried on for a period of nine years with the subordinate fungi, or germs, he is led not only to adopt, but to endorse with fresh and convincing arguments, the opinion long ago expressed by other observers, that the germs of infection in the above-named maladies belong to the same group of living organisms as the familiar ferment of putrescence—that is, to the group of bacteria which are so exceedingly minute that, according to NAEGELI, 30,000 milliards of them make up the weight of one gramme.

That certain soils, such as that of Munich, are especially productive of typhus, is explained by NAEGELI, taking PETTENKOFER'S views into account, in this wise :—

"The first condition of a malarious soil, breeding endemic and epidemic maladies, is underground water, lying not too far from the surface, with alternate rise and subsidence of level, resulting in alternations of wet and dry strata. When these strata become dry, the germs cling to the earth, and where the soil is light and the air follows the subsiding level of underground water, the germs pervade this underground atmosphere, and if there be an issue towards the surface they will rise through it into the open air."

He shows very clearly that this underground air is attracted into houses by the suction of the fires in the kitchen and other rooms ; and he adds that the best warmed rooms are the most dangerous. Professor NAEGELI therefore sets his face against heated bedrooms at night, and even suggests that by heating some other unoccupied room at night the course of the germs may be diverted from the sleeping rooms.

But it appears that the germs cannot rise with the underground air whenever the stratum of earth containing them has again become wet, either by a fall of rain from above or by the elevation of the underground water level. The germs will then cling to the ground so firmly that not even a powerful current of air avails to detach them.

Two remedies are suggested for this chief cause of an epidemic soil: the complete removal of the underground water, or at any rate its relegation into

lower depths ; or, if this be impracticable, the maintenance of a constantly uniform surface level of the underground water.

To guard againt the penetration of air ascending from epidemic soil, Professor NAEGELI recommends cementing the cellar floors and walls, and the ground floor ; and, as the underground air not only rises into the interior of houses, but makes its way through the walls as well, he further suggests an air-tight outer casing for the foundation walls. Finally, with regard to the constitution of the soil, the danger will increase with the degree of its porosity or capacity for holding underground air, and of its readiness to dry. Hence firm clay soils are exempt from infection, while the most unhealthy soils are those consisting of gravel and coarse sand intermingled, like the Munich soil.

Professor NAEGELI'S experiments, which extended over a period of years, on the conditions of the generation and growth of the subordinate fungi or germs, have led him to the conclusion that these fungi require as nutrient elements of existence certain substances which are soluble in water. But they can live only on condition that the pabulum so formed shall consist of certain proportions of water and food materials—in other words, provided that the solution has the required degree of concentration. Here we need only consider the effect of an augmentation of this degree, and I shall adduce a few familiar examples by way of illustration.

The fermentation of wine must, fruit-juices, brewers' mash, etc., is effected by means of the fungus familiarly known as "barm, or yeast." This process of fermentation may be checked by simply

withdrawing some of the water from these juices, that is, by thickening the liquor, when fermentation will cease, because the germs cannot subsist in this excessive proportion of the nutrient material—*i.e.*, in this case, of the sugar. A similar effect is produced if, instead of drawing off water, the quantity of sugar be increased.

The same applies to the germs of putrescence. To prevent the tainting or putrefaction of meat, some of the water is withdrawn from the juices, which are thereby thickened. The degree of concentration under which the germs lose their potentiality for decomposition and dissemination is not equally high with all the species. Professor NAEGELI divides them into three classes in this respect: the bacteria, to which belong the ferment of putrescence and the germs of disease; the yeast fungi, the most familiar among which are the brewers' yeast and the vinous ferment; and the fungi which produce what is called mildew.

Now between these three cases it should be noticed that, while the yeast fungi need and bear a higher degree of concentration than the bacteria, they are in this particular far surpassed by the mildew fungi. For instance, a moderate drying will stay putrefaction of meat, but to prevent mildew, a much higher degree of desiccation is necessary. A comparison between the germs which cause mildew and fermentation may be instituted by reference to fruit-juices and preserved fruits. Moderate thickening will suffice to check fermentation, but to guard absolutely against mildew the thickening process must be carried much further.

Any substance which germs are unable to use as

aliment becomes injurious to their existence when it has attained a certain degree of concentration. This point is of great importance in its application to what is called disinfection, and NAEGELI points out that insufficient disinfection, as of cesspools, for instance, involves much more risk than the total neglect of it.

He says :—"If germs derived from cholera, dysentery, and typhus cases find their way into cesspools they will only retain their specific nature for a short time, thereafter they either die or lose their infectious properties. On the other hand, the consequence of insufficient disinfection—*i.e*, of disinfection short of the degree of concentration that kills—is that morbific fungi will continue to germinate and ferment, while at the same time, and for that very reason, they will preserve their specific nature of infection. Such inadequate disinfection, therefore, is tantamount to preserving the germs, whose infectious quality is revived when they, through insufficient disinfection, emerge into the upper air, and make their way into the human body."

The most interesting of Professor NAEGELI'S observations is that there occurs a *struggle for existence* between the different species of the germs when they come into contact in a nutrient solution. Not only does this explain the connection between the process of bodily hardening and the power of resisting epidemic attacks, but also many phenomena attending the fermentation of liquors ; and on that account I am induced to dwell at somewhat greater length upon the subject, quoting NAEGELI'S own words :—

"It was formerly assumed that any plant will be found wherever climate and soil favour growth, pro-

vided that seed had previously reached such spots. Now, however, we know that this depends quite as much upon its surrounding fellow plants, and that in particular the most closely allied species will exert a decisive influence. Many species can grow in certain localities only if others ranking in the same genus be wanting. For instance, the rusty-looking Alpenrose thrives well in calcareous soil, but only when the hairy Alpenrose is absent. If the latter be present, it will utterly extirpate the former. The like holds good of the two primrose species found upon more or less damp grounds."

(I may add that the most familiar amongst these plant struggles are those occurring between useful growths and weeds.)

"The same law governs the lower fungi. One genus, which under given circumstances will thrive well, is exterminated by another genus which here appears the more favoured plant; whereas the former, under differing conditions, is strong enough to expel the latter. Inattention to this fact has given rise to many erroneous assertions respecting antiseptics."

To render these phenomena more intelligible, I will adduce an example. If germs of putrefaction, or fermentation, and of mildew be placed in certain saccharine solutions having a neutral reaction (that is, neither acid nor alkaline), only the first-named will multiply, setting up lactous fermentation. But if to the same solution be added a half per cent. of acetic acid, the germs of fermentation alone will multiply and cause vinous fermentation, whence it comes that must, containing too little acid, will turn sour; and if, finally, 4 or 5 per cent. of tartaric acid

be put into the same solution, only mildew fungi will be produced.

It would be wrong to conclude from these facts, which infallibly recur on every occasion, that a half per cent. of acid prevents putrefaction, and 4 to 5 per cent. prevents fermentation ; for the germs of putrefaction will actively multiply in the same nutrient solution with an additional 1½ per cent. of tartaric acid, *provided they be not exterminated by the germs of fermentation.*

I may explain that must, or unfermented new wine, without acid would unquestionably turn sour, and a rather large proportion of acid would be needed to prevent the souring of the wine ; but if, on the other hand, vinous ferment be added, the latter will gain the advantage, even with a low percentage of acid.

Professor NAEGELI then goes on to show that the strength of individual numbers also exercises a decisive influence in the struggle. It would appear that when one kind of germs takes possession of a solution in great numerical strength, it will vanquish its adversary, if the latter be in a minority, under conditions that would ensure its own defeat were it deficient in numbers itself. This we see in unfermented wine and brewers' mash ; to prevent them from souring, yeast is needed in such quantity that it may retain the mastery over the ever-intruding germs of the acetous ferment. With a knowledge of these facts we can explain the relation of the body to the germs of disease.

The following is the fourth instructive discovery of Professor NAEGELI respecting the subordinate fermenting fungi. Each species excretes certain

elements, which as a rule are entirely characteristic of itself. Thus vinous ferment and brewers' yeast throw off, as a special excretion, tartaric acid ; the "mother of vinegar," vinegar ; the rennet or lactous ferments, lactic acid ; other ferments butyric acid, and the ferment of putrescence the well-known offensive effluvia.

It may be observed of these excretions, that they imperil the existence of the germs themselves whenever they accumulate beyond a certain percentage in the solution which the latter inhabit.

Thus, for instance, fermentation will cease in must-liquor very highly charged with sugar, when the percentage of alcohol has attained certain given limits, even though there should still be a sufficiency of fermenting material—that is to say of sugar—unless by exposing the solution to the air the notoriously volatile tartaric acid is allowed to escape.

The same applies to decomposition. In open cesspools putrefaction proceeds until all the material matter is resolved, because the offensive excretions of the fungi escape ; but when a cesspool, fosse, or ditch is kept closely shut down,—of this I myself have had manifold experience with putrescent sea-water and decaying carcases—the process of decomposition is completely arrested, as fermentation would be in a well-corked bottle.

NAEGELI especially addresses himself in his book to the task of determining from his experiments what preventive measures should be adopted with reference to the morbific germs existing elsewhere than in the body ; but of this question I shall not speak now. He only explains part of the phenomena

of the relations of these germs to the living body, although he might certainly have elucidated the whole problem from his experience of them in inert solutions.

What NAEGELI correctly apprehended is shown when he gives, as an illustration of the relation of these germs to the living body, the case where, in his experiments, two different kinds of germs came into conflict in one nutrient solution.

This bears directly upon the contest between the germs and the living tissues of the human body, which begins in a nutrient solution suited to both the combatants alike; and very important is NAEGELI'S assertion that the contest turns upon numbers. Therefore since the number of the bodily tissues concerned is a fixed quantity, it will depend upon the *numerical strength* of the germs whether they will set up disease.

The assault may be so overwhelming that the body will infallibly succumb; but even the most dangerous germs of infection are powerless for evil if the attack be commenced by an insufficient number. NAEGELI rightly says that until he made this discovery he had altogether doubted that the infecting matter could consist of live organisms, for he reasoned as follows:—

"One such germ in a sufficiently nutrient solution, which the human body usually affords, can propagate 100,000 individuals within seven or eight hours, and would thus infallibly induce disease. Yet this cannot be the case, or we should be driven to the impossible conclusion that during an epidemic of cholera or typhus fever those that sickened had alone inhaled or swallowed these tiny micro-

scopic germs, while all other members of the community had not."

The fact that, during the prevalence of an epidemic, one section of the inhabitants enjoys good health, another feels but slightly affected, a third sickens more seriously, while a fourth section dies, some speedily, others after protracted illness, is ascribed by Professor NAEGELI to the varying strength of the infection; but he does not take into account that it must also depend upon the condition of the body and its juices, as to which of the two combatants in the struggle shall gain the victory. In this direction he touches upon the familiar experience that a person once attacked by small-pox, scarlet fever, typhus, etc., will for a greater or less subsequent interval of time enjoy immunity from those disorders. In this, as we shall see, he is correct, without, however, hitting the mark as accurately as he might have done from the knowledge gained in his experiments with germs elsewhere than in the body.

Researches prosecuted for many years having long ago convinced me that an inordinate percentage of water in the body will intensify liability to sickness, I at once recognised in NAEGELI'S discoveries the true explanation of the fact ascertained by me, that seasoned soldiers enjoy greater immunity from infection than men less far advanced in the term of army service. Strong and sustained bodily exercise stimulates the activity of the skin, draining the water out of the body—that is, it reduces or thickens the mass of the bodily juices.

In times of infection this of itself is an advantage for the living tissues of the body, because the firmer

these are set, the greater will be the energy of the vital forces for the struggle with the germs of infection, which are weakened in proportion as the degree of concentration of the bodily juices is raised. Hence a comparatively small difference in the percentage of water in the body may decide the issue in the struggle of the latter against the germs of infection.

What may therefore be learnt from these discoveries as applicable to infectious diseases?

That the latter take root in that effete bodily condition which is the consequence of an irrational manner of living. I have examined from this point of view whatever is known respecting all kinds of epidemics, and everything confirms this. Were it customary to live according to the dictates of reason, to steel, harden, and temper the body, we should be as exempt from epidemic disease as are animals living in the open air.

Destructive infantile disorders, like scarlatina, measles, and quinsy, are emphatically maladies of enervation and enfeeblement. The prevalent irrational treatment of children, not only in their infancy, but also during the school years, is responsible for these disorders.

THE SPECIFIC GRAVITY OF THE BODY.

(1878.)

THE discovery that a superfluity of tissue water in the body materially increases its liability to sicken from infectious disease became a keystone for my studies on "Strength of Constitution," a term which includes the question of greater or lesser

liability to sickness, as well as that of the working capacity. Not only did it now clearly appear upon what strength of constitution is based, and by what means it may be enhanced, but also that it can with a large degree of certainty be estimated by measurement.

In compiling a tabulated statement of measurements of soldiers, for the purpose of calculating the averages of health for each of the three years of army service, I had at first no suspicion of the astounding result obtained by the computation of the weight per liter (quart) volume of the individual soldier; indeed I feel satisfied that no professional man would have expected to find so great a variation.

The smallest liter-weight among the sixty-five men measured amounted to 764, the highest to 1,060 grammes,* a difference of almost 40 per cent. If in these two extreme cases the men were equally tall and stout—that is, of quite the same bulk, say 70 liters—the light man would weigh 118 lbs., the heavy man 159½ lbs., so that the latter would be heavier by 41½ lbs. The difference is the more surprising, if we take into account that these two men were almost of the same age, varying only by one year; that the light man was by no means a sickly, feeble subject, but apparently so healthy and strong that no objection had been raised to his admission into the army. Still greater differences will be found if the specific gravity of people of the lowest constitutional vigour could be measured.

If the differences in the weight of the liter volume of the strong and the weak amounted merely to a fractional percentage they might be regarded as a

* 1,000 grammes = 1 kilo = about 2¼ lbs.

curious scientific discovery of no practical importance. But the case stands otherwise.

An instrument is required which will determine, even with approximate accuracy, the bodily bulk. A method of testing the bodily condition would then be supplied, which, in point of accuracy and diversity of application, would far surpass any that has hitherto been devised. Now such an instrument can certainly be constructed, not by a scientific man without the necessary means, but at the public cost. The simplest way of ascertaining the bulk of the body is by its immersion in water, but this plan is cumbersome and inconvenient, and is impracticable with invalids, females, etc. As against the above method, the following apparatus is worthy of consideration. It consists of an enclosed air-tight chamber, connected on the one hand with an air-gauge, and on the other with a second chamber, the air in which can be forced into the first-named chamber. If the first chamber contain nothing but air, the air forced into it from the second chamber will raise the column of mercury in the gauge up to a certain point. By introducing a compact body into the first chamber, and thus displacing the air, the column of mercury will be made to rise above the level previously attained, in proportion to the greater bulk of the body intruded. Consequently the bulk can be correctly estimated from the height of the column of mercury. And if the body be subsequently weighed, the division of the weight by the number of volumes (liters) will give the weight of each liter.

Small instruments of this kind already exist, but the problem is to build an apparatus large enough

in dimensions to admit an adult. The cost would not be great, and the money would be well expended, as I shall show.

The question now arises respecting which properties of the body will the determination of its weight per unit of capacity (liter) afford information. The answer must be sought in a consideration of the parts which the various bodily constituents that are weighed play in the production of vital phenomena.

The lightest bodily substance, if we put aside air, is the fat, with a liter-weight of 937 grammes. Important as an element of nutrition, it becomes injurious when present in excess, causing a diminution in the quantity of blood, and impeding the circulation, while its decomposition evolves an abnormal amount of heat. Corpulent people are incapacitated for strenuous work, because they so rapidly become heated; and if overtaken with illness they readily develop strong feverish symptoms.

Next to fat, water presents the lowest liter-weight, namely, 1,000 grammes. Some of the injurious effects of an excess of water in the body have already been explained, but I will recapitulate the most important points:

1. Superfluous water renders all the tissues flabby, and diminishes their power of resisting mechanical strain. They become more brittle, as regards the bones, are more easily lacerated and distended, and the natural coalition of the organs suffers. Thus bone fractures, dislocations, bruises, lacerations, twisting of the intestines, etc., and the intrusion into the system of alien matters, incluing the germs of infection, will more readily take place. These

diminish the capacity for strenuous labour, and constitute so many extra risks of sickness.

2. Excess of water in the muscles has a disabling effect, imparting a feeling of lassitude; a watery muscle is powerless, and tires quickly.

3. Excess of water in the tissues is particularly injurious in its action upon the nervous system. It heightens the sensibility of the nerves, so that trifling influences produce painful and morbid excitement. Persons thus affected easily catch cold, suffer from nervous irritability, and in short are exposed to all disturbances of the nervous system. Moreover, excess of water in the nerves becomes a hindrance to the transmission of their excitation, which is bad in every way; for it increases the liability to sickness, while lessening the capacity for work, particularly mental work. The flow of thought in the brain is obstructed, reflection becomes difficult, sluggish, less comprehensive, and the memory fails. There is a form or idiotcy, in which the brain cavities hold abnormal quantities of free water; but an excess of water permeating the brain substance will of itself induce dulness.

4. The injurious effect of an excess of water in the blood and other bodily juices can be inferred from what has been stated in a preceding essay on the subject of liability to infection from disease germs. A watery condition of the stomach and bowels favours the propagation of the seeds of infection in the *primæ viæ*, or alimentary canal, so that the germs of cholera, or dysentery, or probably of mucous fever, are enabled to make a general attack against the body, and will more readily ferment if the bodily juices be watery.

While certain quantities of water and fat are necessary to the existence of the human body, any excess above the indispensable proportion is detrimental. But since every other constituent of the human body is specifically heavier than the water and the fat, a body which possesses these in an excessive quantity must be specifically lighter than one normally constituted ; so that a man of inferior specific gravity will be less fit for work, both physical and mental, and less capable of withstanding morbific influences of every kind.

The conclusion, based upon the nature and influence of the lighter bodily constituents (water and fat) that the low liter-volume of the living body is an unfavourable sign of its condition, is confirmed when the heavier elements are considered.

I have ascertained by experiments that thoroughly dried muscular flesh has a liter-volume of 1,357 grammes (water 1,000, and fat 937). Now we know, beyond a doubt, that the actual working substances in every living tissue are those which remain after drying—*i.e.*, the so-called albuminous substances, and the salts always found in combination therewith. The more plentiful the supply of such substances in the living tissue, the more energetic are its vital manifestations. A muscle, for instance, will be firmer and more powerful in proportion to its solid constituent parts, and the same applies to the energy and rapidity of its contractions. The larger the amount of solid constituents in the brain and general nervous system the more energetic will be their manifestations. The same may be said of the intestines, etc. Chemical experiments show that the mass of solid residue in the tissues may present

very considerable divergence (as much as 32 per cent.), and thus it is quite intelligible that a strong person, thoroughly fit for work, should exhibit a much higher specific gravity than a weak, sickly person.

Lastly, a cardinal point is the quantity of bone-earth or phosphate of lime. Of all the elements largely entering into the constitution of the body, this is the heaviest, namely, 3,180 grammes per liter-volume. It is well known that the robust possess strong, compact bones, while the weak have delicate and light ones. The more energetically a man works, the more powerful become his bones—that is, firstly, they increase in length and thickness; secondly, the protuberances to which the muscles grow become enlarged; lastly, not only does the bone substance accumulate material, but it hardens, and acquires a higher specific gravity. We see this in animals; the bones of the domesticated hog or cow, which takes little exercise, are spongy and brittle, while the bones of the same animals in a wild state are extraordinarily hard, compact, and heavy. The following illustration will make this easier to be understood. If coal or wood be consumed in a stove, the products of the fuel will be of two kinds—the *gases* that escape through the chimney, and the *ashes* which drop into the ashbox. The quantity of ashes collected will show what amount of work the stove has done. The process in the body is analogous: the more the body works, the more nourishment will it use up, giving rise to substances (such as carbonic acid, water, and urea) that quit the body, and yielding ashes, which the body retains, in the form of bone-earth. The bones

collect the ashes, and the larger their store the greater has been the amount of work performed by the body. Hence old people have a larger store of bone-earth than young persons; but if of two individuals of equal age one possess more bone-earth than the other, it will be an unmistakable sign that the former has done more work than the latter, either from superior diligence or the force of circumstances. Thus the specific gravity of a man shows whether he is active and accustomed to labour or not.

These considerations are of importance in their application, both to the practice of medicine and to health-culture. On the latter point they lend additional weight to the arguments with which I have repeatedly sought to enforce my sense of the value of hardening the body by the promotion of the activity of the skin, the thorough ventilation of rooms, etc.; because it is now obvious that these measures not merely afford protection against colds and chest complaints, but also operate as preventives against epidemic contagion.

In this discovery there is much that is reassuring; for, having regard to the enormous difficulty of warding off the attacks of these invisible germs of infection, and of evicting them when in possession; considering, moreover, that the range of infectious diseases continually widens with the extension of facilities of communication, an anxious temperament might give way to despondency. My researches remove the main ground for discouragement. If the body be adequately hardened, infection need be no more apprehended than colds and chest complaints, and the method which I have explained of

ascertaining, by determining the specific gravity, whether the requisite degree of hardening has been attained, should give additional force to this sense of security.

Lastly, the whole rule of health may be summed up in the simple maxim: Procure, and maintain, the highest possible specific gravity—that is, firstly, prevent the deposit of fat; and, secondly, promote the elimination of water from the tissues, avoiding anything calculated to check it.

THE SANITARY COAT.

(1878.)

I WISH to lay great stress upon a particular feature which should characterize the Sanitary Woollen Clothing, as my own personal experience in the matter has been truly astonishing. It was first suggested to me by the excellent results which I have found in medical practice from the application of the "Reglin" poultice to the front middle line of the body, from the pit of the neck to below the navel. The remarkable relief thus afforded to the blood-pressure is due to the terminal convergence in this region of all the blood-vessels in the trunk of the body, and to the considerable enlargement of their areas, consequent upon the stimulating action of the poultice. This is tantamount to expansion of the minute blood-vessels of the entire surface of the trunk; and as upon their size depends the measure of evaporation, it follows that their expansion will cause the skin to give off watery vapour with greater freedom and rapidity.

This shows that particular attention should be paid to the middle line of chest and stomach—that is to say, the clothes should keep this part *warmer* than the other surfaces of the body, which is easily effected by means of a double-breasted coat, similar to that worn in the Würtemberg regiments. The two sides of the coat are made to overlap, whereby the middle line is covered twice as thickly as any other part of the body. This plan for maintaining extra warmth operates similarly to the Reglin poultice. The double covering secures a more abundant blood-supply for the entire skin, and the vapoury cutaneous exhalation thereby produced can easily escape where the coat is only of one thickness. Two conditions are indispensable.

1. The coat, be the weather ever so warm, should at all times *be kept buttoned up all the way*, as prescribed in the Army. Those to whom this may seem irksome will find it so only at the very first. Every soldier will bear witness to the comfort of the buttoned-up coat.

2. Beneath the coat neither waistcoat nor white shirt should be worn, simply the Sanitary Woollen shirt.

In short, I may say that the double-breasted Sanitary coat is the most conducive to health, because it hardens the body in a remarkable degree, while it at the same time affords the best protection. Coats so constructed are certainly the most elegant and most healthy wear for men.

Now I pass on to my personal experience. I have been wearing the coat as above prescribed for the last eight weeks. On several previous occasions I had striven, with no little perseverance, to cure my-

self of a debilitated bodily condition, taking Turkish baths, active exercise, carefully ventilating my rooms, dieting myself, etc., but with only limited success. For instance, the measurement round the stomach, where the size chiefly indicates the deposit of fat, fell only from $37\frac{3}{4}$ to $35\frac{3}{8}$ inches, whereas the normal measurement should not exceed $29\frac{3}{8}$ inches. During the holidays, indeed, I had at times succeeded in reducing it to $34\frac{5}{8}$, but in spite of all it rose again to $35\frac{3}{8}$. During the first few weeks the Sanitary coat itself had little effect, but when the weather grew warm, the superfluous fat commenced to disappear, without any other special device of mine, at so rapid a rate that the measurement round the stomach by this time only amounts to $32\frac{1}{2}$ inches, while my fitness for work and my general health have improved in a corresponding ratio. My preconceived theory was therefore justified beyond my most sanguine anticipation, for having regard to the ill-success of former endeavours, I did not look for such rapid effect.

THE SOURCE OF THE EMOTIONS.

(1879.)

I DEFINE the physical source of the emotions to be subtile essences bound up with, and emanating from, the albumen in the bodily tissues. These essences may be divided into two main classes or principles, which are opposed to one another in the effect which they produce, and which may be distinguished by the terms "salutary" and "noxious."

In a condition of mental equanimity or composure these principles are inactive, and only when a decomposition of albumen in the tissues occurs are they set free ; they then become perceptible to the senses, especially to that of smell, and create in the body in which they take rise that which is called emotion, or mood.

When essence in the form of the "salutary" principle is liberated, the emotions or mood are cheerful, enterprising, and courageous, and the body enjoys food ; but if the form be that of the "noxious" principle, there are gloom, depression, want of courage, and a distaste for food.

Mental equanimity or composure is restored when the essences cease to be liberated, and when the portion set free has been removed from the body by means of the respiration, cutaneous exhalation, or the other excretions.

As I have said, these essences can be smelled, and are otherwise palpable to the senses. My readers may obtain evidence of this for themselves. As a rule the "salutary" principle is fragrant ; the "noxious" principle tainted and offensive. The odour may be most readily perceived in the hair of the head, and is more defined in the adult than in the child. Of course pomade or hair oil would interfere with the genuine scent.

If the subject of the test be of a cheerful, pleasant mood, in good humour, the scent will be agreeable and sweet ; but if sorrowful, depressed, in pain, or unwell, the scent will be disagreeable. This is particularly noticeable when persons are in the anguish of fever, so much so that the odour is perceptible immediately on entering the patient's room.

Terror or, with children, the fear of punishment will elicit a very disagreeable odour, which has led many a teacher or father when chastising a child to form an erroneous conclusion, although terror and dread do also affect the bowels. The offensive odour, however, exhales from skin, mouth, and nose, and as I have proved by experiments, directly from the brain as well. If a portion of brain substance be pulverized in a mortar, and a few drops of nitric acid be added, exactly the same odour is obtained.

I emphatically remark that I am here speaking of things which the experience of many of my readers will confirm, and all can very easily convince themselves of the correctness of these assertions, which have a great practical importance, especially in connection with my recommendations on health-culture. At present I will only add that whether the "salutary" or the "noxious" principle shall be released will depend upon the force of the excitatory influence which has caused the decomposition of albumen in the tissues. This may be very clearly demonstrated with the white of a hen's egg. If boiled with one of the weaker acids (or even nitric acid), it will emit a flavour of chicken broth; but if, for the purpose of decomposition, some strong agent like phosphoric acid be employed, the offensive odour of the excrement of poultry will be given off. Similarly, if the sensations are agreeable in their nature, they must be of *overpowering* intensity to liberate essence in the form of the "noxious" principle; while if the sensation be of an unpleasant kind, although much less intense, the essence will no longer emanate in the form of the "salutary," but in that of the "noxious" principle.

Before I proceed to deal with practical deductions, it will be necessary to explain the important bearing of these principles upon the health of the body. We know from every-day experience that sickness and depression, and, conversely, health and cheerfulness, usually go hand in hand. Upon closer observation, there is found to be a very intimate connection, and it is especially worth while to study the relation of the "noxious" principle to disease.

Physicians have long been aware that great terror, great dread, will, without the concurrence of any other cause, avail to bring about the most serious derangements of health, even sudden death. Also, that illness is attended with much greater risk when associated with worry, grief, or depression; while it will augur well for the issue if the patient be relieved from apprehension, and a state of cheerful confidence, or, at any rate, of composure be established. Further, that terror, dread, grief, and care materially lessen the power of resisting certain disorders, foremost among which are the epidemic diseases, such as the plague, cholera, dysentery, and small-pox. Of cholera, for instance, it is known that a man thrown into a state of intense dread at sight of the dead body of a cholera patient will almost certainly sicken, and often with such speed that within a few hours he may be in sound health and die. Similarly, in time of war, armies beaten and pursued present a far more favourable field for the ravages of epidemic disease than their pursuers, flushed with victory, even though the defeated and the conquerors have occupied the same camping grounds in succession.

For all such phenomena there has hitherto been no satisfactory explanation; they have been ascribed to

nervous agencies, entirely overlooking the real cause —a peculiar volatile essence, the "noxious" principle, which permeates all the bodily juices and affects them in the manner of a poison. That some such influence must be in operation might have been inferred from the fact of hair turning white as a consequence of dread, grief, or care; this has been known to take place in a single night, when persons have been exposed to great dread or sorrow. Here the nervous system cannot be the agent, for the nerves do not reach into the hairs.

My researches make these phenomena clearly intelligible. The volatile "noxious" principle, when released from the brain, enters the blood, whereby it is circulated to every part of the body, working upon each particle of living substance as a paralyzing poison. Any reader who has once experienced it knows how terror and dread affect the organs which are moved and controlled by the will. The limbs refuse to act, the voice is choked in the throat, everything is loosened and relaxed. However, the trouble does not end there, for the other organs present similar phenomena. The sensory nervous system is disabled. In the alimentary canal the paralyzing action occasions an exudation of water, as attested by watery evacuations. Other signs are, outbreaks of perspiration upon the epidermis, and augmented renal excretions.

As regards epidemics, if an infectious disease prevail in any place, and the germs of it be disseminated in the air and drinking water, there must be numbers of people into whose system they will gain admittance through the vehicles of food and drink, without necessarily inducing sickness. Sickness will only be developed when the condition of the

body is favourable to the germs; such a condition requires, firstly, that the bodily juices shall contain a certain percentage of water, for if it be insufficient the infection cannot take effect. This is the reason why, as shown in the essay on "The Causes of Disease," the process of hardening (water elimination) protects the body from infection. Secondly, the degree of vital energy in the tissues, especially in those of the walls of the intestines, which are first attacked by the disease germs, is an important factor. It will readily be understood that if the emotion of dread will set free within the body a noxious element, having power, as shown above, to paralyze all the living tissues, including the walls of the intestines, the same cause would suddenly annihilate the body's faculty of withstanding the influence of infection.

In describing the third condition—hitherto partly unrecognised—under which infection may be spread by epidemics, I am compelled to refer to things somewhat unsavoury. This is unavoidable, however, when writing on the question of health-culture; for the source of many diseases will be found to lie in dirt and things unsavoury, as to which an accurate knowledge is necessary if the diseases are to be guarded against.

Physicians have long been aware, and so in part has the general public, that the effluvia emanating from water-closets and privies are dangerous to health, and that people who inhale such effluvia are very liable to catch infectious diseases. Hence at the outbreak of an epidemic it has latterly been customary to make a thorough examination of these places, and to get them disinfected. But a want of correct apprehen-

sion of the question has caused people to go astray in their measures of precaution.

For instance, it is generally supposed, since infection has been known to proceed from living organisms, that the offensive effluvia of water-closets and privies are not in themselves dangerous, and become so only when they contain these germs. That is an error. The mere inhaling of such effluvia will not produce cholera, typhus, or dysentery, but if with the breath the effluvia enter the bodily juices, and thus pervade the entire system, their action will be identical with that of the mal-odorous "noxious" principle. Liability to infection is thereby increased, and all that is needed for infection to ensue is that the living organisms, however originating, should make their way into the body with the air, food, or drink, which, during the prevalence of epidemics, may very easily occur. These germs might not have worked harm had not the way for them been prepared by inhaling the effluvia. The reason I will give presently, but I must explain one other circumstance which has hitherto remained unnoticed.

The alimentary canal of the body is the original source of the effluvia in question. Being extremely volatile, these emanations, while yet in the body, penetrate from the intestine into the bodily juices—a fact shown in every post-mortem examination—and thence they issue by means of the cutaneous evaporation. Their effect on the bodily juices in reference to epidemics is the same as if they had been inhaled, and as that of the mal-odorous "noxious" principle.

The essence of the foregoing statements is, that

between the effluvia engendered within the body and the seeds of infection there is a relation, which I will now endeavour to explain.

Notwithstanding that each animal and plant carries within itself every element that appertains to the nutrition of any living being, yet each individual will feed upon a special kind of nutriment, and in some cases only upon a particular plant or animal. This peculiarly applies to parasites ; for instance, a dog-flea might find in the human blood whatever is required for its nutriment, but has no relish for it ; in fact, all vermin and parasites have their peculiar tastes, and where these cannot be indulged they will not settle or thrive.

The same thing applies to the germs of infection. They are parasites which in two respects have their special tastes. They settle only upon one or a few kinds of animals. The cholera germs thrive upon man ; but they are attracted only by the mal-odorous "noxious" elements of the body, while the contrary fragrant "salutary" elements are not to their taste.

The reader will readily understand the deduction to be drawn. Within the body are continually generated two odorous essences, of opposite character —the fragrant "salutary" principle, and the offensive "noxious" principle,—to which latter also belong the excretory effluvia. Accordingly as the latter or the former principle prevails, the liability to infection is greater or less. This throws considerable light upon the method which should be adopted of coping with epidemics.

From the foregoing the reader will have realised to some extent the great practical importance of being able to control the volatile essences above

mentioned. I will endeavour to make this plainer. The sanitary aspect of the question may be stated thus :—The smaller the amount of the mal-odorous essences contained in the bodily juices—in other words, the lower the proportion of the "noxious" principle within the body—the greater will be the capacity of resisting infection. I have previously shown how this capacity is affected by the quantity of water in the tissues, and the matter may therefore be summed up as follows : the lower the proportion of water in the tissues and of the "noxious" principle, the greater will be the security against disease. The question whether we have it in our power to procure this desirable condition of the body, I answer unhesitatingly in the affirmative, and I am able to state by what means. But I must first advert to the moral, as distinguished from the physical, aspect of the matter, for my experience shows it to be of high importance.

Before proceeding further, however, let me point out that I am not ventilating mere speculations, evolved from my inner consciousness while sitting before my desk. I am discussing facts, proved and tested upon myself personally and the members of my family, as well as upon some friends who were willing to listen to my explanations and to carry out my suggestions.

Of the three moods engendered by the causes already described—equanimity; cheerfulness, or joy; and dread, grief, depression—the last named is induced by the presence of the same "noxious" principle which has been previously shown to imperil the health of the body.

Every increase of the "noxious" principle in the

body—no matter how and whence arising—creates a sense of dread, apprehension, discomfort, and oppression, or induces that condition in which the impressions of things and events, which would otherwise be indifferent, become a source of annoyance. Whereas, conversely, the lower the proportion of the "noxious" principle within the body, the more cheerful and light-hearted is the mood, and the more perfect the equanimity. If anything arises to disturb the composure, the promptitude with which equanimity is restored will be according to the rapidity with which the emanation of the "noxious" principle passes from the tissues, as I will explain further on.

SANITARY WOOLLEN CLOTHING.

(1879.)

THE body has the peculiarity of defending its property of fat, tissue-water, and of the liberated volatile essences. It takes advantage of every careless movement, every opportunity, however apparently insignificant, to repossess itself of that which has been wrested from it. This is a familiar experience as regards fat. Corpulent persons, wont to repair to Carlsbad, or to resort to some other kind of anti-fat regimen, no doubt lose a few pounds on every occasion, but as soon as the special treatment is over the fat will re-appear. I experienced this in my own person when I began my researches on the subject of health-culture. Every forcible remedy adopted produced a slight diminution in the measurement round the body, but as soon as I ceased the

special cure I returned to my former size. At present, however, I am really master of the situation. In a few months my measurement round the body permanently receded to the extent of about $5\frac{1}{4}$ inches, while the weight per liter-volume of body bulk rose by 15 grammes (or $1\frac{1}{2}$ per cent.), and my flesh, in point of firmness and hardness, resembles that of the most seasoned soldier. Nor did this entail any particular trouble in the accomplishment, for the entire change, including the elimination of superfluous water and of liberated emanations from the tissues, has been brought about by the adoption of a *suitable change in the system of clothing*, combined with thorough ventilation of the living and sleeping rooms, and with—in my own special case, where the elimination of fat presented the chief difficulty—four pedestrian tours, each lasting over some days.

As regards the clothing, several points need consideration. First comes the material of which it is made. I have already shown that animal wool meets the requirements of health-culture to a much larger extent than materials made of vegetable fibre, such as linen, hemp, and cotton, in consequence of the much greater impermeability of the latter to watery vapour. The German proverb, describing a healthy, comfortable man as one "sitting in the wool," goes to show that popular usage is in this particular in advance of science; and it is indeed hard to understand how linen and cotton should have so long and so extensively held their ground as clothing materials.

The rate at which this question has been maturing within the last decade is instructive, and important to the right apprehension of the practical deductions and suggestions which I have to make.

My own earliest practical application of wool was to advise persons subject to colds to wear a strip of flannel next to the skin, from the chest down to the stomach, and some benefit was certainly derived therefrom. Next followed the use of undervests, and finally of woollen shirts, worn under white shirts. This was an error. The body was indeed protected, but at the same time enervated, and the woollen shirt, placed between the outer white shirt and the body, soon became moist with perspiration and disagreeable. For this reason many doctors pronounced against the use of woollen shirts, but this was again an error. Not the woollen shirt, but the overlying white shirt produced the evil, and should have been discarded. I recognised this in the year 1868, and at once made my opinion known. Then came the Franco-German War, 1870-71, and the experience gained in it opened up a wide career for the woollen shirt, although the mistake was still made of wearing a white shirt over it. I now find, however, that it does not depend upon the shirt alone—that is to say, it is not sufficient to wear a woollen shirt without a white one over it,—but that *all* linen and cotton material in the clothing, not excepting that used for lining and stiffening coats, etc., and for pockets of coats and trousers, is pernicious to health. The clothing should be made throughout of pure animal wool. How astonishingly sensitive the body is to the benefits of this I have had many opportunities of observing in my own circle.

When I came to rightly understand the matter I began by substituting woollen for the linen or cotton linings. This could not be effected all at once, and

some coats which were held not to be worth the extra expense were to be worn out to the end with the old lining. However, if one of us had been wearing an altered garment for any length of time, and then put on one not altered, there immediately supervened, with more or less distinctness, that feeling of uneasiness which arises from incomplete evaporation of the "noxious" emanations. This would wear off, but the harmonious condition of the body changed for the worse. The mood was less equable, and the tendency to take cold was greater. These symptoms disappeared when the coat made entirely of wool was resumed.

Similar experiments were instituted so frequently, and were so constantly followed by the like result, as to remove all doubt as to the accuracy of my researches. My readers can test the matter for themselves.

The material, however, is not the sole consideration; the *cut* of the clothing must also be taken into account. I may state generally, first, that the clothing will be the better for fitting quite tightly, so as to allow the least possible movement of air between the clothes and the body; and second, that it should be twice as thick along the middle line of the trunk from neck to abdomen, as at the sides or back.

Another point for consideration is the number of garments that should be worn one over the other. For men and boys the clothing should consist simply of woollen shirt, woollen socks (elderly people may wear stockings), cloth trousers fitting as closely as is practicable, and cloth coat. The coat sleeves should be lined with woollen material, and these, as well

as the trousers, when the latter do not fit tightly (as, to be perfect, they should do), must be closed against upward draughts by webbings sewn in them and fitting round the arms and ankles; therefore no drawers are required, no waistcoat, and no overcoat, not even in winter time, except when driving, and the cold is so severe as to make the very wheels ring. This winter, although the thermometer stood as low as 12° (Réaumur) of frost at Stuttgart, I never wore an overcoat, and, indeed, felt that it would have been altogether superfluous.

Among the various men's coats now generally worn, all such as cannot be made to close right up to the neck and to fit compactly to the figure should be laid aside as wholly unsanitary. An examination of the interior of an old coat will reveal an astounding quantity of rubbish secreted under the lining for purposes of padding, stiffening, etc. This becomes saturated with the mal-odorous "noxious" emanations of the body, and freely evaporates them under influences of heat or moisture.

I should now like to say a word on women's dress, but I approach the subject with a certain amount of diffidence, for here habit and prejudice are even more potent than with men, and I have to declare war against such cherished finery as silk dresses, white petticoats (often starched so as to make them thoroughly impermeable), linen stays, cotton or silk stockings, and white starched dresses, which enclose the whole body as though under a glass cover. Then, again, women are so fond of their store of linen, take such a delight in the diversion afforded by interminable washings and ironings and starchings, that I fear they will condemn me as a disturber of the

peace of households, who is bent on creating a cheerless waste in the laundry and press-room. Yet, seeing that my own wife has not only become reconciled to the new order of things, but declares that she would not willingly revert to the *status quo ante*, I will venture to proceed. Chemise, stockings, drawers, petticoats, and stays should all be made of pure animal wool. These, with a dress of pure woollen stuff, closing well round the throat, and having a double woollen lining at the chest and downwards, should be the winter and summer wear of women, who would then participate in all the advantages which I have described, and of which they stand even in greater need than do men.

THE OPEN BEDROOM WINDOW.

(1879.)

A BOOK might easily be written on the immense advantages attending the practice of *always* sleeping with the bedroom window open, and on the great disadvantages which arise if this rule be neglected; also on the progress which has been made in the treatment of disease since it has been recognised as a prime necessity of life and health that the atmosphere immediately surrounding the body should freely mingle with the open air.

It cannot be too often insisted upon that the body will not be hardened or empowered to resist the attacks of disease unless there be thorough ventilation of the bedroom. To ensure this, in mild and quiet weather two windows should be open at top, when more than one person is sleeping in a room. But, however cold or severe the weather,

one window should always be open at the top, although the air can be prevented from blowing on the sleeper by the interposition of a blind or a curtain. To endeavour to ventilate a bedroom by an open window in an adjoining room is useless, as will quickly be recognised by the nose, which is the best test as to whether a room is properly ventilated.

If on returning to a bedroom in the morning from the fresh air it is found to be in the least stuffy, the ventilation is insufficient. Nor is this stuffiness merely a sign that the air is impure ; the odorous matters whose presence it indicates are the "noxious" elements of the body's exhalations, and have a distinctly deleterious effect when they are inhaled with the atmosphere which they pervade. Various unfounded objections have been raised, tending to establish the injurious qualities of the external atmosphere when breathed at night by sleepers. For instance, it is stated that the night air is laden with carbonic acid, which is dangerous to the breathing passages when inhaled. In making this assertion the fact is overlooked that the breathing passages invariably contain air charged with 4 per cent. of carbonic acid, while the proportion in the night air is at most 4 per *thousand*. I myself have made the experiment of charging the atmosphere with carbonic acid up to 1 per cent., without in the least affecting my breathing. On the other hand, if the water that streams down inside the window of a closed sleeping-room be collected, one drop of this liquid, impregnated as it is with the "noxious" exhalations given off by the sleepers, will suffice to poison a rabbit, as has been shown by actual experi-

ment. Those who have adopted the Sanitary Woollen System do not perspire at night, and are not subject to the chills of which persons clad in linen and sleeping in sheets are so greatly in dread. The woollen clothing and bedding afford ample protection ; and if the head, from baldness, or the thinness of the hair, be especially sensitive, some extra light woollen covering may be provided for it. The difference in the effect on the spirits, and in the refreshed, instead of jaded, feeling on rising from bed, when, by means of the Sanitary Woollen Clothing and Bedding, and the open window, the "noxious" exhalations of the body are allowed to pass freely away, instead of being inhaled over and over again, can only be appreciated by those who have tried it. Children no longer toss about in their beds and throw off the clothes, leaving the lower limbs exposed, while the face and hair are clammy with perspiration. In the hottest nights they lie cool and comfortable, just as they went off to sleep.

THE DEODORIZATION OF THE BODY.

(1879.)

ONE effect of the adoption of the Sanitary Woollen Clothing and Bedding, both in my own case and in that of all persons experimented upon, is very confirmatory of my teaching, and is not devoid of interest from a practical point of view. This effect I may call the *deodorization* (or sweetening) of the body. Where surrounding conditions tend to check evaporation, the watery vapour given off by the body is apt to acquire

a taint. Frequent ablutions and change of linen will reduce its offensiveness, but it can never be thoroughly cured except by means of the Sanitary Woollen Clothing and Bedding, and of open bedroom windows at night.

The disadvantages imputed to woollen underclothing by several professional men—among whom I may mention the famous HUFELAND—such as weakening and irritating the skin, are not imaginary, but very real, *when cotton or linen shirts are worn over woollen materials*, or when cotton or linen linings to the waistcoats, coats, etc., are retained; whereas, if nothing but woollen upper and underclothing be worn, all such objections disappear.

It will serve as a hint to other novices in the Sanitary Woollen System, if I state that several have written to me that during the first few days after putting on the Sanitary Woollen Clothing the skin gave off a copious secretion, by some described as noisome, by others as sticky, necessitating a frequent change of shirt; but that very shortly this ceased, and the shirt acquired and continued to retain the pleasant "salutary" odour.

I have referred to these communications, as otherwise alarm might be caused by similar experience, whereas if benefit is to be derived from the System, any such secretions retained in the body must be expelled from it.

Now I come to another practical point. I mentioned before that water-closets and privies had long been under suspicion of causing and facilitating the spread of infection, and that on this account certain regulations had been suggested

under the name of *Disinfection*. It was thought that fluids poured down would kill the living organisms of infection. Soon, however, it was discovered—and the botanist NAEGELI confirms it in his book noticed in a previous essay—that in most cases these germs are not killed; but that the fosse, pipe, or drain is simply freed from offensive smells, *i.e.*, "deodorized" instead of being disinfected. This was therefore accounted a useless proceeding, as merely doing away with the unpleasant impression produced upon the nostrils, and Professor NAEGELI holds the same view, which, however, according to my researches, is wrong. No doubt, the complete extermination of the disease germs by a process of disinfection would be preferable, but deodorizing presents the very great advantage of putting an end to those offensive effluvia, the inhalation and collection of which in the body adapt it to take infection. The nose is truly the sanitary sentinel. We should follow its warnings, and avoid every kind of stench, attacking the cause with the utmost energy by deodorizing, at any rate, if complete eradication be impossible. Stench alone will not cause illness, but protracted inhalation of tainted air adapts the body for contracting disease, particularly infectious disease.

Here, perhaps, I should say a few words with reference to a fact, based on incontestable statistical accounts, in apparent contradiction with my teaching. Labourers and others engaged in sewer work, whose occupation compels them to pass their lives in an atmosphere heavily charged with sewer gases, enjoy almost perfect immunity from such epidemic affections as small-pox, cholera, typhus, etc.; but in

discussing this point I fear I should need to assume too much insight into scientific details on the part of my readers. I will therefore be content to say that the above fact is not only in accord with my assertions, but supplies another proof that the presence or absence of certain odorous elements in the bodily juices will decide the issue of susceptibility to contagion. I will only point out that the effluvia arising from newly-voided ejecta emit a very different odour from that of sulphuretted hydrogen, etc., emanating from foul drains. The first-named odours are more dangerous, because inducing liability to infection; the latter, on the contrary, as secretions of the ferment of putrescence, are analogous to the germs of infection themselves, and act, when in a higher state of concentration, as preservatives against the seeds of infection, upon the same principle that inoculation with cow-pock matter protects against infection from the congeneric germs of human small-pox.

The power of resistance to the influences of temperature I formerly attributed entirely to the elimination of the superfluous tissue-water, but my further investigations have satisfied me that the deodorization of the body has also a share in it. My conclusion rests, among other grounds, upon the phenomena observed in the pursuit of my researches on the other section of the causes of disease—that is to say, on matter by which infection is conveyed. I have not made exhaustive experiments specially directed to the elucidation of this question, yet what has come under my notice incidentally is instructive, and must, as I judge, prove interesting to others.

The reader is aware that the so-called catarrh of the respiratory organs, particularly in the form of colds and coughs, is one of the complaints most frequently and easily communicated. Formerly the members of my family and myself constantly contracted catarrh. A child would bring it home and pass it on to the rest; or visitors, suffering from colds and coughs, would convey the contagion by means of the customary embrace. This winter, however, although opportunities were not wanting, no one in the house was infected, but I observed more than once that, after being together with a person suffering from cold, all the symptoms of an on-coming cold and cough would become manifest. There ensued sneezings and fits of coughing, but instead of the usual preliminary feverish stage and dry throat, succeeded by much watery mucus, subsequently changing to thick phlegm, expectoration set in at once, and the matter was ended.

One of my children came home from school complaining of indisposition and faintness, which he had first felt when in school. While a warm drink was preparing for him, the boy vomited, and an hour later he was out of doors again. The matter brought up did not show that the child had eaten anything calculated to disagree with him.

It has happened more than once that in the evening a member of the family would exhibit such symptoms of serious illness as feverishness, headache, dry, hot skin, and languor. But nothing was done beyond administering a glass of strongly-sugared water, and no real illness broke out, the patient invariably recovering by the next day.

That a capacity for resisting infection has been

attained is confirmed by the following observations which I have made. In former years my children, especially during the first year of school attendance, brought home every kind of infectious disease which made its appearance in the school. My youngest girl went to school for the first time this winter. Opportunities of catching various complaints have been plentiful, for more than a third of the children in her class were away at one time on account of illness. My little one, however, brought home no sickness, and went through the winter, like all the rest of us, exempt from any ailment. Further, the two children of a neighbouring acquaintance, who are constant companions of my two little ones, have had the whooping-cough since the commencement of the winter, and that is well known to be catching. As might be supposed, intercourse between them was consequently restricted ; but, to my certain knowledge, they met quite frequently enough to communicate the complaint ; yet, although my children had never had the whooping-cough, they did not catch it from their playmates. Of themselves these observations would of course not suffice; but taken in connection with all my other experiences, and considering the general conditions of infection, they possess, to my mind, sufficiently conclusive evidence to enable me to give the following succinct explanation of the change which is effected in the body by the agency of deodorization.

The mal-odorous emanations within the body act upon the nervous apparatus similarly to dust on the clockwork of a timepiece, retarding its movement, and rendering it irregular. The defence of

the body against extraneous influences, whether of heat, cold, or infection, will depend upon the prompt intervention of that which the doctors term "reaction," and which takes its rise in the nerves. This is the force, provided it operate betimes, that should avert illness in the shape of cold, inflammatory action, or infection; while, if the reaction be too long delayed, the mischief is done.

As regards infection, the absence, as previously explained, of the particular odorous elements favouring the propagation of the germs will constitute an obstacle to their effecting a speedy settlement. Thus, the reaction of the hardened body casts out the agent of cough and catarrh infection, by means of a prompt secretion of mucus ere it can effect a footing. Anything injurious which may enter the stomach is removed by immediate vomiting. Exposure to cold at once causes a more active transmission of blood to the integumentary vessels, with the result of kindling warmth in the skin; while in an overheated room, or in front of a blazing fire, the blood-supply in the skin is forthwith diminished, thus preventing the disagreeable sensation of undue warmth.

This view is confirmed by other observations on the members of my own family. Stomach, heart, lungs, and brain all display greater vitality. My wife and myself until lately had very difficult digestions, and needed much caution in the matter of indigestible dishes, whereas now we can venture upon all sorts of food without the slightest inconvenience. The heart-beats in my own case have long been too quick, numbering eighty-four per

minute, when I was perfectly still; but for the last few months I reckon seventy-five per minute—the normal number of beats for a man of my age—while under the strain of exertion no such increase takes place as before.

Last year my repeated attempts at gardening miscarried, owing to rapid heating and perspiring, and fatigue in the arms; but now, although I had no practice through the past winter, I can do several hours' digging and hoeing without strain. In short, each bodily function is freed from influences which previously restricted its action.

THE GERMAN GYMNASTIC SUIT.

(1879.)

WHEN I commenced my studies on the subject of health-culture, some ten years ago, I stumbled against a paradox which long puzzled me, and of which I have only now found the solution. I refer to the question of the value which should be attached to gymnastic drill in regard to health-culture.

The more I investigated the conditions of the maintenance of health and of the power to withstand morbific influences, the more fully did I feel satisfied that gymnastic drill must be conducive to health. On the other hand, I could not shut my eyes to the fact that members of German gymnastic clubs or schools, when compared with other people, are in no way so much more healthy as might be expected from the deductions of scientific investigation.

People with whom I have discussed the subject

would call to mind the case of this or that enthusiastic gymnast of their acquaintance who had died prematurely. Especially suggestive were the cases of two well-known Stuttgart gymnasts, one of whom died of pneumonia, the other of dropsy. I am well aware that no health-culture can perpetuate existence, but that both these men should have died in the prime of life appeared not to lie within the natural order of things.

I now know, or, to speak more modestly, I believe that I know, the reason of the notorious sanitary ill-success of the German system of gymnastics. The unfortunate selection of the material of the regulation gymnastic suit not only mars the usefulness of the tempering and hardening of the body, which should result from gymnastic drill—in that it renders the effect merely transient—but is actually a source of danger. That gymnasts do not possess well-hardened bodies may be seen at any visit to a gymnastic festival.

Very exceptional exertion should be necessary to wring copious perspiration from a man who is properly "trained." The strain on gymnasts at festivals, where they rest after each of their brief exhibitions, is not of a kind to cause perspiration in men in thorough training, and yet how much perspiration is shed at gymnastic matches, notwithstanding the light costume! Not only are the shirts soaked, but the outer clothing too is stained with perspiration.

A chill will readily strike inwards when the skin is covered with perspiration, and there is no more inadequate protection against chills than that afforded by a white shirt and a duck jacket saturated

with wet. Further, if we consider the energy with which the proper training "form" is counteracted by liberal potations of beer, we shall no longer wonder at the sanitary ill-success of gymnastic drill, nor at the passive resistance offered to it by the majority of the public. For these reasons I am anxious to impress upon all gymnastic clubs and associations that it behoves them, both in the interest of individual members and in that of their otherwise most excellent cause, to remedy the evil pointed out.

The bad effects of faulty clothing in school gymnastics will also be apparent from the foregoing.

THE ATMOSPHERE OF SCHOOLROOMS.

(1879.)

ALTHOUGH the badness of the atmosphere in overcrowded schoolrooms is a somewhat hackneyed subject, I purpose to treat of it here, because the researches which I have detailed in the previous essays not only clear up much that has hitherto been unexplained, but also furnish several practical hints.

The reader will recall my explanation of the relation of the odorous elements of the body's exhalations to the emotions or mood, and the distinction which I drew between the "salutary" and the "noxious" principle. Accordingly as the former or the latter predominates, the mood will be cheerful and equable, or depressed and irritable.

The effect of checking the free passage of these emanations from the body by a false system of clothing, etc., has, so far, been chiefly kept in view ;

but there are other aspects of the question which have not yet been touched upon.

First, the quantity of these emanations present in the blood is increased when they are inhaled from an atmosphere which is laden with them.

Second, the exhalation given out by the body is entirely different, accordingly as the mood is cheerful or depressed.

When the mind and body are at rest, the exhalations principally consist of the emanations which arise from the food during and after digestion. These belong to the "noxious" class, and their accumulation, for instance, in badly-ventilated bedrooms, accounts for the depressed, irritable mood which is frequently experienced on waking from sleep. These emanations are practically unintermittent, but so soon as the emotions are called into play, are either combined with the "salutary" or with further "noxious" emanations, accordingly as the mood is cheerful or the reverse.

When a teacher terrifies and tyrannizes over his pupils, the "noxious" emanations evolved by the digested food are combined with those induced by the emotion of dread; and the atmosphere of the schoolroom will be much more rapidly and forcibly filled with "noxious" exhalations than when the teacher handles the pupils so that they are not in constant fear and dread, but preserve their equanimity.

The "noxious" emanations exhaled by the terrified children are inhaled by all occupants of the room, not excepting the teacher himself. This tends to increase the latter's irritability, while the effect on the children is to paralyze and confuse their mental powers and to destroy their control

over that which they know—they cannot think of it, become excited, and "lose their heads." Thus, no one escapes the evil influence of the increasingly deteriorating atmosphere, and the schoolroom becomes a purgatory both for teacher and pupils. That, in spite of all severity and punishment, less will be learned than if the atmosphere had been pure, is self-evident.

From this may be deducted three rules :—

1. The greatest care should be expended on the ventilation of the schoolrooms. Let the teacher remember that otherwise he will be punished by the bad effect upon his own temper.

2. Teachers should not treat their pupils roughly, and so as to terrify them, but in a friendly, encouraging, even cheering manner. If, for instance, they can arouse the children's laughter by a joke or witticism, the distraction will do no harm ; on the contrary, the "salutary" essence thus released will lighten the labour of learning, and its exhalation will have a beneficial effect upon pupils and teachers alike.

3. There should be no school held after dinner, while digestion is going on, because then the "noxious" emanations are freely evolved, and quickly corrupt the atmosphere of the schoolroom. As much will be done in one hour before, as in two dours after dinner.

SUMMER AND WINTER CLOTHING.

(1879.)

WE have had to wait for the summer, but within the last few days it has set in with intensity. The newspapers have chronicled many cases of

sunstroke, both among civilians and in the army, while the number of those who sigh and perspire under the infliction of the sun's rays is legion. How does the heat affect people clad in wool and wearing the Sanitary coat?

According to my own experience, and to the communications received from others, I can answer that the Sanitary Woollen Clothing has acquitted itself splendidly. Not but that we too have perspired, nor that we perspired much less—assuredly not more—than others, but because the perspiring is effected much more easily and opportunely; that is to say, before the perilous thickening of the blood sets in, which in extreme cases causes apoplectic fits. Here I may mention that it is a mistake to suppose that it is part of the Sanitary Woollen System to keep on the coat uninterruptedly, even in the greatest heat. On the contrary, a follower of the System may do that which people with the ordinary style of clothing hardly dare to venture.

After freely perspiring, the coat may be removed without fear of the consequences, and with considerable refreshment. This is a privilege which others cannot enjoy for fear of taking colds.

I advise wearers of the Sanitary Woollen Clothing not to seek relief in unbuttoning or opening their coats when the heat is intense. The relief is only felt at first, and soon changes into a feeling of an opposite character, for the partial cooling along the middle line of the chest quickly interferes with the body's power of evaporation. The only correct plan is either to take the coat off, or to retain it closely buttoned up. In walking, when the heat is great, it is distinctly better to keep the coat closely buttoned

up. At first the perspiration will pour out freely, although it will soon cease, unless, indeed, the weather be excessively sultry. But when the destination is reached the coat may at once be removed, thus reversing the practice of wearers of "vegetable fibre" clothing, who may march in their shirt-sleeves, but must put on their coats when they rest, if they would guard against catching cold.

I have considered the question of summer and winter clothing at some length, and have found that it requires something more than an off-hand answer. If we turn to the feathered and hairy animals, we shall find that by no means all of them alternate light summer with thick winter clothing.

Among hairy animals, otters, beavers, and others that are amphibious, make no such change, neither do the genuine inhabitants of the desert; for I never observed anything of the sort among the antelopes and wild asses at the Vienna Zoological Gardens. Lastly, no such change, as a rule, takes place with birds. Thus, among animals provided with a special vesture, those most liable to exposure and climatic influences do not vary their clothing with the seasons. The only hairy animals with whom the change is really marked are those which live in the woods and fields; and that is quite intelligible.

When the woods are thick with foliage, and the fields stand under growing crops, these animals find themselves no longer in the open air, but buried in the covert, and surrounded by a damp atmosphere, which greatly impedes the evaporation from their bodies. Nature has then placed these animals under a covering of leaf and grass, and the body naturally

endeavours to lighten its clothing. When autumn scatters the leafy and grassy covering the case is reversed, for then heavier coats must counteract the exposure. With animals not liable to such alternations, and with the majority of birds, especially those always on the wing, this change does not take place.

In our climes, civilized man must be compared with the birds rather than with the animals of the field and forest. For, like the birds, both in summer and winter he is in the open air, and even when indoors he is surrounded by dry walls, and not by plants constantly throwing off watery vapour. Therefore, observation of the animal world does not teach us to change our clothing according to the season.

The answer will be to the same effect if we consult men leading a comparatively natural existence. The shepherd opines "that which is good for cold protects against heat," and puts on his cloak when he feels too hot. In Hungarian pasture lands the shepherds wear the sheepskin bunda both in summer and winter, with the difference that in summer they turn the woolly side outwards, and in winter inwards.

As regards my own experience, last summer I wore somewhat thick coats, and came through the heat most comfortably. This summer I passed in a lighter dress, but I perspired much more. I will not positively say that this was due to the thinner coat, for, owing to the excessive moisture, it was a very "perspiring" summer, but the above experience certainly did not encourage a change of coats in summer and winter.

To obtain a correct view of the matter, I questioned other wearers of the Sanitary Woollen Clothing, and their experience coincided exactly with my own. At times they perspired considerably, but decidedly less than in former years, and with greatly diminished annoyance.

INHALING OF DUST.

(1879.)

THE introduction of so-called dust to the respiratory passages is, under certain circumstances, a frequent and not insignificant cause of disease, especially when the body's power of resistance is impaired. I may instance a case in point, which is instructive, as showing how illness may originate, and hence what precautionary measures should be taken.

Last autumn a change in the direction of my eldest son's studies required of him that he should overtake class-mates who had been studying Greek for the last four years, whereas he had done no Greek before. Notwithstanding my endeavour to meet the effects of this strain by prescribing specially invigorating diet, notwithstanding, too, that my son wore the Sanitary Woollen Clothing, all the symptoms of over-exertion became apparent: diminished mental energy, defective memory, loss of equanimity, bodily exhaustion. Another instructive symptom, as bearing upon my former elucidations of this subject, was the remarkable diminution in his specific weight. At the end of the autumn holidays his specific gravity had amounted to 1,111 grammes,

and when I weighed him again at Christmas it had fallen to 1,060. This low bodily condition endured through the winter school term, and in the spring the following occurred.

My little garden in the course of the winter had been twice dressed with liquid manure, and when in the spring we set about digging up the ground the dry weather had set in. The clods had become as hard as stones, so that we had to pulverize them, which, with a strong east wind blowing, raised a great quantity of dust. Besides myself, my eldest son and one of my daughters engaged in the work, and we were all exposed to the inhalation of this dust highly charged with manure. The consequence to my daughter and myself was a somewhat violent and obstinate catarrh, but quite unattended with fever, and we were able to continue our usual avocations. My son, however, fell ill with a species of severe influenza, and was completely prostrated for ten days. I then allowed him ample time for recovery, and his convalescence proceeded so favourably that by midsummer his specific gravity had risen to 1,127 grammes.

This case, besides bearing out my doctrine of epidemic immunity, goes to show that the same description of dust which will produce general constitutional derangement when the powers of resistance are impaired, will only excite local irritation in the air-passages of the lungs when the body is properly hardened. Thus the condition of body procured by the Sanitary Woollen System, although it may not afford absolute protection against the injurious consequences of dust inhalation, will certainly render them less dangerous; in testimony

whereof, if time and space permitted, I might adduce a whole series of further observations.

It does not follow, however, that we should neglect the removal of dust from contact with the atmosphere which we breathe, for even a harmless catarrh can hardly be reckoned among the pleasures of existence; while continuous inhalation of dust, such as people in certain trades are exposed to, may effectually sap the foundations of health. Still, followers of the Sanitary Woollen System need feel no more apprehension respecting the inhalation of injurious dust than they feel of colds and epidemics. But those who, in despite of timely warnings, obdurately persist in clothing their bodies in vegetable fibre, must be content to bear the ills of which they deliberately incur the risk.

CATARRH.

(1879.)

WHEN a new practical sanitary measure is discovered, inquiry must be made not only as to what it can accomplish, but also as to what it cannot accomplish, I mention the incident which I shall presently relate, because I have had repeated proofs that a very general preconception stands in the way of a clear understanding of the sub ect of catarrh.

The preconception referred to consists in the belief that every cough and cold in the head is directly referable to what is called catching cold. If that were so, people who adopt the Sanitary Woollen System should never suffer from cough or catarrh,

otherwise my contention that the clothing renders its wearers impervious to the influence of the weather would be incorrect.

Repeated experiments have clearly shown that the Sanitary Woollen Clothing System, when properly and completely carried out, does protect against chill. As, however, the experience of myself and others shows that cases of catarrh will occur—generally of short duration, but occasionally violent—I have investigated each instance of the kind with special reference to its cause.

The process of investigation consists in examining the mucus issuing from the nose or mouth. In such examinations I have generally found the cause of the supposed catarrh in the shape of some intruded foreign body. Either corpuscles were directly visible to the naked eye, or the grey colour of the mucus pointed to soot or smoke inhalation, or the microscope would reveal the presence of what is generally termed "dust."

I will, however, recount a particular instance, because it illustrates another not uncommon preconception.

During my holiday tour I was awakened suddenly one night by a violent fit of coughing, that lasted for fully ten minutes. Eventually I coughed up clear mucus, which I deposited on a plate that I had previously wiped. After repeated expectoration the irritation in the throat moderated, when I again lay down. On looking up at the ceiling, the air in that direction seemed to me close and confined, and the inclination to cough came back again.

This was a sufficient hint, and I turned my head towards where the fresh air was streaming in

through the open window, when I was soon sound asleep again. Next morning I discovered that the wall-paper near the ceiling was mouldy, and in the collected mucus I could distinctly perceive grey particles of dust. Unfortunately I had not a magnifying glass by me, to ascertain decisively whether these were of the nature of white fungoid moulds.

The reader may possibly ask what there is remarkable in this occurrence. Everyone knows that people will cough when something gets into the throat. And yet the case is worthy of remark, for it shows how, if the body is thoroughly hardened, the respiratory organs at once, and powerfully, react when dust is inhaled, and continue to do so until the disturbance is removed. But a debilitated constitution has not the capacity of such reaction; the body cannot assist by means of the needful secretion of mucus; there is a dry cough for two or three days, but no dislodgment of the disturbance, and when the flow of mucus at length sets in, the organ is already affected. Those whose bodies are hardened by the Sanitary Woollen System sneeze and cough on occasion with great force, but very quickly the necessary loosening of mucus takes place.

Had what happened to me in that hotel befallen a man clothed in vegetable fibre, he would probably have contracted a thorough catarrh, and would have accounted for it by saying that he must have caught a cold from the open window.

THE SHIRT, THE TROUSERS, AND THE HAT.

(1879.)

THE ordinary form of shirt—not of double thickness in front, and opening down the middle—is altogether unsanitary, especially when worn at night, or not under the closely buttoned-up coat. The blood recedes from the skin, and if this continue, or circumstances be otherwise unfavourable, the constitution, even when the body is not actually chilled, will suffer a loss of vigour in consequence of diminished cutaneous action.

I have therefore caused a shirt to be designed, which is of double material over the chest and downwards, and fastens on the shoulder. This pattern supplies a sanitarily perfect shirt, in which people, even when divested of their coats, and under unfavourable conditions, may go about in safety, as I can testify from numerous experiments. In devising this plan and shape, I also considered the female sex, who attach so much importance to fashion in dress, that the fundamental principle of the double covering of the chest can only be certainly secured by properly constructed chemises and nightdresses. As regards the choice of fabrics, after very careful consideration, I gave the preference to stockingnette webs. They are more porous and supple, and on that account more durable, while they feel more comfortable on the skin and are less liable to shrink than flannel.

As to the trousers—until very lately I had limited

my instructions to the recommendation that they should be made of woollen material only, but various observations which I have made on the subject have convinced me that the trousers should fasten so as to continue the middle line of extra warmth. Nor let it be imagined that in this I am merely riding a hobby. I advise everyone to make the change, especially those who need to melt away superfluous fat, or persons subject to disorders of the stomach or digestive organs.

As regards the hat, two points call for consideration. It should be made of animal fibres, and no lining of cotton, or linen, or leather is admissible; instead of the latter, a strip of felt should be inserted, or else the hat should be quite devoid of lining, like a Turkish fez. (No one who has tried the woollen felt lining in the hat will care to revert to a lining of leather.) Not only are the fashionable hard hats bad on account of their imperviousness, which checks the natural evaporation from the head, but the shellac used in stiffening them has an injurious effect, which is not the case with the cherry gum employed in the make of soft beaver hats; old beaver or felt hats can be altered to conform to the principle of the Sanitary hat. To those who are bald or are threatened with baldness, or profusely perspire at the head, or suffer from headache, I especially recommend the Sanitary Woollen hat.

NORMAL DURATION OF HUMAN LIFE.

(1879.)

A FRENCH naturalist first pointed out that domesticated animals live five to six times as long as they require to grow to full size. A horse, for example, is fully grown in four years, and remains fit for work up to the twentieth year, as a rule ; dogs of the larger breeds grow for one-and-a-half to two years, and live to the tenth year ; and the same law obtains among other hairy animals with whom we can estimate the limit of age.

That the rule also holds good in reference to man may be learned from tribes living in a wild state. The native Australians, for instance, perhaps the most perfect specimens of men in a natural condition still extant, reach their full stature between the tenth and twelfth years, becoming old at from fifty to sixty. Properly speaking, they never ail, and in particular are free from epidemic disease, their life being such as to have an especially hardening effect on the body, as they go quite naked, and build themselves no habitations.

Considering, therefore, that in our climes full growth is attained on an average about the eighteenth or twentieth year, the normal termination of life should take place at the ninetieth or hundredth year. That potentially we are endowed with such longevity, is shown by the isolated examples of centenarians of both sexes met with in every calling and every country. Consequently, putting accidents on one side, we must conclude that deaths, when occurring at a less advanced age, are the direct result of

the unnatural mode of life adopted by civilized man, partly, indeed, on compulsion and without any fault of his, but to a great extent from ignorance or carelessness. In some cases the foundations of disease are laid in childhood by improper methods of rearing, while in others a debilitated constitution is hereditary.

It is, therefore, evident that much remains to be done in the interest of a national system of health-culture, both publicly and individually; and it is certainly a cheering sign of the times that, within the last decades of the present century, this important task has been taken up in the most various quarters in a manner heretofore unknown.

Many will be alarmed at the idea that all, or even a large percentage of mankind should live to so great an age; for, as it is, the progressive increase of population in Germany is proportionally greater than that of the supply of food.

This is, so far, correct, and the extraordinary prolongation of life of all weakly persons might be unfair on the bread-winners, who must support them. But if health-culture be devoted to raising the standard of working capacity, such fears will speedily vanish. To the man who is capable of work and whose body is hardened, the whole world lies open nowadays, and there is room for the further dissemination of the human race for centuries yet to come.

DIPHTHERIA.

(1880.)

THE principle which obtains among students of nature, that an isolated case does not warrant general conclusions, is perfectly sound ; yet when such an isolated case tallies with a theory supported by a whole series of facts, such as that which I have put forward respecting immunity from epidemics, it is not without weight.

I have stated my conviction that, judging from all appearances, the Sanitary Woollen System should afford protection against diphtheria. And a case of this complaint, lately occurring under my own roof, confirms the accuracy of my surmise.

The reader may remember the case of my eldest son, who, owing to several months' severe application to study, lost specific weight in a very remarkable degree, and then contracted influenza. This time my report refers to my youngest boy, six years old, whose attendance at school commenced only last October.

As with most young birds on first quitting the nest, the new life proved a heavy cross to him, and for weeks there was weeping and wailing ; he cried and was troubled whenever he had to start for school. In addition I must mention that whereas his class-mates had had a year's teaching in the infant-school, and could therefore read and write a little, my boy knew absolutely nothing, and consequently was obliged to work exceedingly hard to get abreast of his companions. After a few weeks the

same symptoms supervened as in the case previously mentioned of my eldest son : the flesh turned flabby, he complained of fatigue after a quarter of an hour's walk—whereas, in the previous summer, he had quite manfully walked for seven hours with me one day—was peevish, cried often and long ; and the exhalations coming from him were almost always offensive ("noxious" principle).

Last week he began to cough, and when, a few days after, I came to examine him, he presented a complete case of diphtheria. The continuous development of the "noxious" principle had overcome the influence of the Sanitary Woollen System against disease, exactly as had happened in the case of my eldest son. Still the little fellow kept up, and an attempt of my wife's to make him stay in bed utterly miscarried ; there was never any trace of fever, and after my touching up the throat two or three times the child was quite himself again.

Convinced that the other members of the family would enjoy full immunity as a consequence of the Sanitary Woollen System, I did not isolate the lad, but merely forbade him to kiss any one. Three days after I had discovered diphtheria in the boy, my youngest daughter, nine years old, complained of a tickling sensation in the throat. An examination revealed no signs, and therefore I did not interfere. In the afternoon she said she felt unwell, and on finding her slightly feverish I sent her to bed. A few hours later she vomited three times at very brief intervals. Next day she was still somewhat out of sorts, and I now ascertained that the bowels had not been moved on that nor on the previous day. This was soon remedied, and she has since been perfectly

well. No one else in the family showed any signs of sickening on this occasion.

From the above case I believe that I am justified in contending that diphtheria is subject to the same law as cholera, typhus, the plague, dysentery, and small-pox; and those who adopt the Sanitary Woollen System, and guard against excessive mental exertion, need not fear infection, or, should they take it, the disease will be mild and unattended with danger.

I have collected similar observations with reference to measles and chicken-pock. In these cases the disease caused no derangement of the general health, and passed off after the second day.

THE CLEANLINESS OF THE SANITARY WOOLLEN CLOTHING SYSTEM.

(1880.)

THE worst description of dirt is that which is offensive to the senses. Linen and cotton, whether worn as underclothing or used for coat linings, etc., acquire an unpleasant odour, as may easily be ascertained; so that even persons who put on clean shirts every day must continue unclean in one respect, for the coat lining cannot be washed, and constantly gives off its offensive smell. The Sanitary Woollen Clothing need inspire no fear on the score of cleanliness in this respect, as it acquires and retains a pleasant smell. When the clothing has been worn some time it may be laid in the sun, or shut up with camphor, when it will be found to have parted with any excess of emanations which it

may have absorbed from the body through lengthy wear.

Then there is the dirt that takes the form of dust, which settles in woollen garments more readily than in others; but this is compensated by the advantage that it can also be more easily removed. A linen dress covered with dust must go to the wash, whereas brushing and beating will take out all the dust in woollen clothing.

Dirt in the form of grease from the animal fat secreted by the skin only presents itself if the Sanitary Woollen shirt be worn for an unduly long period, because it does not take up and fix cutaneous secretions with the same tenacity as linen or cotton shirts. This brings me to consider the dirt that accumulates on the skin. In this respect woollen shirts are truly incomparable. Whereas shirts made of vegetable fibre material attract all the dirt of the skin, converting it into a species of grease to be again deposited in a crust, the Sanitary Woollen shirts brush off the dirt in the form of dry dust so thoroughly that, in a fairly pure atmosphere, the body looks and is as clean as though fresh from the bath.

To sum up, every one is unclean who neglects to wash when dirty, but every one is clean who *avoids dirt;* and, as the body collects much less dirt in the Sanitary Woollen Clothing than in cotton or linen, the inference is clear that, other conditions being equal, wearers of the former are much cleaner than those who adhere to material made from vegetable fibre.

THE COLLAR.

(1880.)

IN this matter my experience has been somewhat singular. It is an old maxim, especially of anxious mothers, that the neck should be well protected, and many people would sooner go barefoot than without some protection to the neck.

I had never paid much attention to the subject, although I have had considerable trouble with the throat at one time or another in my life, but when I discovered the Sanitary Woollen System I assumed that the throat required no special care, and I therefore discontinued wearing a neckerchief. Nor did I make any difference on account of sundry ailments of the throat from which I have suffered within the last year and a half; because such affections recurred at much greater intervals, and were milder in character than formerly, except one particularly obstinate cold caught last spring. Over this I pondered a good deal, for it permanently injured my voice and thereby greatly interfered with my chief pleasure—sitting down at home to the piano and singing a song. Since last spring the voice had retained a persistent hoarseness, the higher notes became impossible at times, and it frequently broke down altogether.

My attention was first directed to the subject of the clothing of the neck when I discovered that, in contradistinction to the Sanitary Woollen shirt, my linen collar very soon became mal-odorous. From that moment I regarded the linen collar as

an unclean thing, and considered how it could be replaced by a woollen substitute.

Frequent inquiries which I received encouraged me in the prosecution of my purpose, but I regarded the whole thing as rather insignificant, and when I first put on my woollen neck-covering, consisting of a cloth cravat and a white cashmere collar, I felt disposed to laugh at myself for riding a hobby, and was pleased to find that the contrivance did not look unsightly. Of course I at once felt the comfort of the wool, but I did not foresee anything more.

On the very next day, however, I felt that the condition of my throat had much improved, and from time to time I expectorated loose phlegm without cough or effort of any kind. When, some days after, I first attempted to sing again, my daughter remarked that my voice sounded plainer and clearer than ever. I had noticed it myself, without attaching any particular importance to the change, because it formerly occasionally varied from better to worse. A few days later I again tried, and my voice was, at the first song, as clear as it had ever been after a quarter of an hour's preliminary practice. This was quite a new experience; but it did not stop there, for I found that my voice had attained an increased compass.

At my best, G had been the highest chest note, and in falsetto C; whereas now B came easily from the chest, and in falsetto E, which I had never been able to accomplish formerly. The cleansing or clearing of the throat by the secretion of mucus continued, and there was no further disturbance, the voice remaining uniformly good, whereas in

former days, even prior to that excessively bad cold it was constantly uneven.

Perspiration is freely exuded at the point where the collar touches the neck, and the linen collar, which readily takes up moisture, whether of perspiration or of the atmosphere, becomes in consequence damp and chilly, and a common source of throat disorders. It is therefore of the highest importance to clothe the neck with material, such as animal wool, which will not set up a chill; and this is recognised by the frequent use of woollen wrappers and comforters. The latter, however, may be dispensed with by adopting the Sanitary Woollen collar and cravat; and I strongly recommend every one, in the interest of his throat, to make the change.

SILK.

(1880.)

I HAVE been often asked to express an opinion on silk dresses, etc. After a careful investigation of the properties of silk I have been forced to the conclusion that, as touching the main point—its relation to the odorous principles—it occupies the same position as vegetable fibre fabrics.

IS WOOLLEN CLOTHING WEAKENING?

(1880.)

I HAVE been asked by one who desires to adopt the Sanitary Woollen System, whether he can, without danger, continue to take a cold bath every morning.*

As this inquiry shows how deep-rooted is the prejudice which ascribes weakening effects to the wearing of wool, I will take the opportunity of discussing the misapprehension indicated in the above heading.

This prejudice is founded upon the fact that a person who has worn a woollen shirt beneath the customary clothing of mixed materials, and who substitutes for it a linen or cotton shirt at the commencement of the warm season, very easily catches cold. The simple explanation is, that the action of the wool accustoms the body to a certain distribution of the blood—that is to say, more blood circulates on the surface and less internally. Linen or cotton clothing has a contrary effect, as it drives the blood from the skin inwards, thereby creating a very important disturbance in the condition of the previously subsisting equilibrium. The delinquent, however, is obviously not the woollen, but the white shirt, whence it plainly follows that the woollen shirt should be permanently retained. I shall be asked why such simple reasoning has hitherto been generally overlooked. The answer is, that when at the commencement of summer woollen shirts were felt to be hot, no other remedy was thought of than to lay them aside until the following winter.

* See "Cold Baths," p. 121.

Here, again, this feeling of oppressiveness was not caused by the woollen shirts, but by the cotton or linen linings to the coat and waistcoat. I discovered that these must be banished from the coat. When I first determined to wear my winter coat and woollen shirt through the summer, I found them inconveniently hot, and I hit upon the idea *to cut out the linings of the coat*, instead of laying aside the woollen shirt ; with that, Columbus' egg was made to stand.

The effect of wool is the exact reverse of weakening ; wool hardens the body, but only on condition that it is *in sole possession*. By overlaying a woollen shirt with vegetable fibre in the shape of coat linings, we produce a similar deadlock as by harnessing horses at both ends of a cart. The vehicle will not budge. Half-and-half woollen clothing does not harden the body, and if its wearer, in his "untrained" condition, exchange the Sanitary Woollen shirt for a white one, he will be fortunate in escaping without an illness during the stage of transition.

The body of a man clothed all in wool is strong and hardened. If he undress in cold weather, the blood, driven for a moment from the surface towards the interior, promptly returns to the skin, affording the necessary resistance to the cold.

THE CURATIVE POWER OF WOOL.

(1880.)

HITHERTO, discussion of the Sanitary Woollen System has been confined to its preventive virtues, and to its relation to the sense of health

and capacity for work, mental and physical. Recent experience, however, has distinctly shown it to possess curative power in a quite unexpected degree.

My reason for refraining so far from publishing such experiences, in spite of many requests that I would do so, has been a reluctance to expose myself to the risk of being reviled as a quack doctor, pretending to work miraculous cures with a universal panacea. For the same reason I now refrain from instancing particular cases and maladies by name, and treat of the subject merely in general terms. Intelligent readers will not fail to extract from my remarks that which may be useful to them.

It is well known that in sickness the exhalations are offensive as compared with those given off in health. A second fact, noticed in my researches, and now fully substantiated, is that the feeling of indisposition, or generally deranged condition, is caused by the presence of "noxious" exhalations, and if these can be dispelled the indisposition is removed.

A third fact is that the most effectual and safe means for the dissipation of such exhalations is an abundant cutaneous evaporation, aided by clothing that will not hold offensive emanations. The Sanitary Woollen Clothing supplies both these desiderata; hence it is a remedial agent in every general constitutional derangement, and *permanently* renders the service which is sought from cold water cures, Turkish baths, gymnastics, etc., where the object aimed at is, in reality, the promotion of cutaneous evaporation, which, however, when thus procured, can only be *temporary*.

A familiar mode of treatment in the removal of solid or fluid morbific deposits from the body, is that

which doctors term counter-irritation, wherein it is endeavoured, by the most various means, to bring out the disease through the skin. The Sanitary Woollen Clothing does this most effectually, because it permanently establishes a more abundant blood-supply over the entire integumentary surface; and in this diversion of the blood in an outward direction, relieving the internal pressure, wearers of the Sanitary Woollen Clothing may find an explanation of the reduction of accumulated fat which they soon experience. Now that which applies to excess of fat holds good of other useless deposits in the body.

There is, further, a series of internal disorders—especially of the abdominal organs—which, if not directly caused by, are yet associated with, an abnormal distribution of the blood, that is to say, the quantity of blood in such organs is inordinately large. The Sanitary Woollen System is also highly beneficial in these cases, by attracting the blood to the skin, thus relieving the internal parts of the body.

On the other hand, Sanitary Woollen Clothing retains those "salutary" emanations of the body which induce a sense of vigour and sound health. These constitute the most energetic and certainly the most wholesome of remedial agents; and may be not inaptly termed the body's "inherent medicine." The best drugs which chemists supply do not agree with every patient, because constitutions differ. A doctor who is unmindful of this law, and neglects to study the constitutions of his patients is capable of working much mischief. No such risk attaches to the "body's inherent medicine;" it is that element which in medical schools formerly went by the

name of *vis medicatrix naturæ*, or nature's healing power, and to which the physician appeals when art no longer avails to save a patient. I have explained that the Sanitary Woollen Clothing collects and stores up this healing power of nature, a popular instance of which is the practice among the poorer classes of taking off a woollen stocking to wrap it round the neck in cases of sore throat.

In most instances the change from ordinary to Sanitary Woollen Clothing proceeds quite smoothly, but in several cases which have come to my knowledge, it has been attended with the appearance of what may be termed a "crisis,"* which is the effort of nature to expel from the body any disease located in it. Under the stimulus of the Sanitary Woollen Clothing the skin exudes copiously "noxious" perspiration, which again subsides, leaving behind a most pleasant sense of health and comfort. The practice of sleeping with the window open in all weathers, which should never be relaxed, is especially valuable during a "crisis," as it assists the free dispersion of the "noxious" emanations which the body exhales.

In short, the Sanitary Woollen Clothing is a curative agency, as powerful and effectual as any of the so-called constitutional methods of treatment. In cases of dyscrasia, where distempered humours have to be dispersed, crises of a more important character may take place, as in other methods of cure. But it would be folly to be discouraged on this account, and to relinquish a remedy which will be *permanent* if the System be adhered to.

* See "The Crisis of Disease," page 101.

PROGRESS OF THE SANITARY WOOLLEN CLOTHING REFORM.

(1880.)

IN the prosecution of this far-reaching reform it is necessary to be ever on the watch to combat and refute prejudices, due to the hitherto sanctioned modes of dress and hygienic tenets ; to neutralize the effect of the opposition which proceeds from those interested in the linen and cotton industries ; and to correct constant mistakes made by the general public in their adoption and practical utilization of the Sanitary Woollen System, referable to imperfect apprehension of the subject.

It may interest my readers if I here give a short summary of what has so far (1880) been achieved. Introduced two years ago, my Sanitary Woollen System has already taken root in all European countries, as well as in the United States, particularly in Germany, Austria, and Finland, where, in every town of any size and importance, many now wear the Sanitary Woollen Clothing. Of course, the greatest progress has been made in my own Swabian district, where, by means of lectures delivered in the chief towns, I have succeeded in firmly establishing the superiority of the new system of dress to that of the old. Next to Swabia, Bavaria ranks foremost, while in the North German States, I understand it is in Hamburg that the System has found most adherents.

With the extensive experience thus acquired, objectionable features of the original designs for the

various articles of clothing have been eliminated, and difficulties connected with the choice of material, nature of web, greater or lesser thickness, cut and make, etc., have been overcome. I will not assert that nothing further remains to be done on these various points, but much progress has been made and improvements have been introduced.

Extensive experience, too, enables me to state that the beneficial effects of the Sanitary Woollen System, as originally tested upon a comparatively small number of persons, which I summed up as power of resistance to weather, disease, and the effects of the emotions, together with an important enhancement of the mental and physical capacities, can be secured by persons of both sexes of every age and calling; provided they will follow the three rules in conjunction, namely to wear the Sanitary Woollen Clothing, to sleep in and on wool, and to keep the bedroom window open at night.

Objections raised against the Sanitary Woollen System, such as danger of uncleanliness, its debilitating effects, its impracticability in the hot season of the year, have not only been shown to be theoretically untenable, upon grounds intelligible to every one with the least claim to technical knowledge, but have also been disproved by the evidence of well established facts.

I would ask impartial readers to note that I do not desire that the truth of my statements be taken for granted; but that a thorough and fair trial should be made of the Sanitary Woollen System, uninfluenced by long-established custom or pre-

judice. Especially would I caution the public against coats not made *throughout* of pure woollen material. Readers will be astonished if they examine the interior of their coats, at the quantity of evil smelling (especially when damp) rubbish which they will find there.

My attention has been drawn on more than one occasion by experts in the wool trade to the fact that, besides interweaving entire cotton yarns in the fabric of buckskins or other stuffs, which is easily detected, many more fraudulent practices are resorted to, such as spinning cotton together with the wool, so as to increase the tenacity of the yarn, and thereby facilitate the process of working in considerable quantities of the cheaper short-stapled wools. My informants added, that as the percentage of intruded cotton is small, the imposture is undiscernible with the naked eye, and hence such stuffs are frequently palmed off upon buyers as all-wool material. That the above statements are perfectly correct, I lately had very striking proof. I examined under the microscope thirty-six cuttings of buckskins, which, in the opinion of highly experienced men of business, were pure, all-wool cloth, and I found six of these cuttings—or about seventeen per cent., contained some admixture of cotton. True, it did not exceed one or two per cent., but it had escaped observation. If the alcohol in wine contains one per cent. of fusel oil, the wine is unwholesome; or if a pastrycook uses in one baking a hundred eggs, and only one of the hundred is addled, the whole baking is tainted. Woollen material adulterated with ever so little vegetable fibre is an analogous case.

VARIATIONS OF TEMPERATURE, AND SUNSTROKE.

(1880.)

IN No. 212 of the *Neue Züricher Zeitung* Dr. MAYENFISCH writes, in an article on "Mountain Climate," as follows :—"Many think to harden the body by seeking to do without extra clothing in the cooler hours of the morning and evening, but this folly must be dearly paid for. The skin promotes or checks the evolution of heat in sympathy with the surrounding temperature ; but as it cannot adapt itself to sudden leaps and bounds of temperature it must be assisted by the clothing. When the temperature is low the clothing should be warmer, while in high temperatures lighter garments should be worn, which, too, may be loosened and opened to facilitate the throwing off of heat. The impediment to this function offered by the closely-buttoned military uniform, when troops are massed in columns, and the consequent accumulation of heat in the body, cause the frequent cases of sunstroke witnessed on the march or on parade. Let everyone, therefore, put on warmer clothing in the early morning and after sunset."

I will now express my view on the subject. The statistics for the whole German army, on which I based my researches on the preservation of health, embrace a period of six and a quarter years, and these instructive returns go to show that, among an equal number of men, the deaths from sunstroke were thirty-four among recruits, twenty among soldiers of two years' service, and only six

among three years' service men. Hence it would appear that, apart from the buttoned uniforms, massed columns, and consequent heat—the causes of sunstroke, according to Dr. MAYENFISCH—another very material element must be taken into account, viz., the degree to which the body is hardened.

The probability of a fatal sunstroke with a thoroughly seasoned soldier of three years' standing is six times less than with a recruit. If, therefore the Sanitary Woollen Clothing have the effect of hardening the body, it must protect against sunstroke. Some cases of sunstroke occurred in our Würtemberg Army Corps in the middle of last August. On the very day of these casualties—a day of most intense heat—a party consisting of myself, my wife, my boy (six years old), and my son-in-law, walked from half-past nine to twelve o'clock to the Federsee Lake, along the Schussenried and Buchau road, entirely without shade. We went on the lake in a boat during the hottest part of the day—two till half-past four o'clock—exposed to the scorching rays of two suns, one from above, and the other reflected in the water, my son-in-law and myself rowing nearly all the time. We went through the day in high spirits, the holiday mood never forsaking us for a moment, and in the evening returned home on foot by the same road, after a most enjoyable excursion.

In the case of wearers of the Sanitary Woollen Clothing, the limits referred to by Dr. MAYENFISCH, between which the skin can perform its function of heat evolution, are very much enlarged, so that only those whose bodies are clothed on wrong principle need lay to heart the advice about morning

and evening dress. The former, if so minded, may reverse the usual order without incurring risk. They may walk with coats buttoned up in the hottest part of the day, and may enjoy the German national game of skittles in the evening, in the draughtiest situation, playing in their shirt-sleeves; in fact, that is just what I did myself on our return to Schussenried on the occasion referred to.

THE WOOLLEN GLOVE, AND STINGS.

(1880.)

AMONG the fruits of a foot tour just brought to a close, is an observation in respect of stinging flies, and since the newspapers periodically fill the air with lamentations about the mosquitoes, I need make no apology for here communicating my experience.

Not everyone is alike sensitive to the stings of gadflies and gnats. I myself belong in a very special manner to the sensitive class. On the spot where the sting is inflicted, there rises an itching tumour which plagues me for weeks. Two years ago I noticed that the swelling, together with the itching sensation, very soon disappeared if the wound were scratched with a small knife, sufficiently to draw a drop or two of blood. Obtaining the same relief on several subsequent occasions, I have since made a point in summer time, as soon as the flies make their appearance, to carry a vaccinator's lancet for the purpose. This year I have discovered another remedy.

First I was stung in the hand by gadflies three

times in rapid succession, on my return journey home from Hohenheim. Simply with the idea of avoiding further stings I pulled on my woollen gloves. To my surprise the itching sensation was allayed in a minute or two, and the trouble was at an end.

On our pedestrian excursion I had further opportunities of observing the like effects, three times upon my own person, once on my daughter. My wife and daughter, who had been in the habit of wearing cotton gloves in summer, assured me that a gadfly or gnat, stinging through a cotton glove, inflicts very great pain indeed. This reminded me that I had also suffered greatly when stung through the white linen trousers of former days.

On another occasion I struck my hand against a stinging-nettle, and as this, too, causes me very great annoyance, I bethought me of my woollen gloves, with the same excellent result. Gnats paid us a visit on two nights during our travels ; several of us heard them buzzing, felt the sting, and found the swelling in the morning. I had six lumps on the legs, which were very troublesome and much swollen ; but scarcely had I put on my closely-fitting woollen breeches when lumps and itching had gone. Such close-fitting breeches, made of stockingnette, are quite as good a remedy and protection against stings as woollen gloves. Loose trousers, made of cloth or buckskin, cannot act in the same way, in spite of the woollen material, because they move backwards and forwards, and thus irritate the wound. Stockingnette cloth *breeches*, on the contrary, cling tightly, and therefore do not rub against the part which has been stung.

(To the foregoing may be added that bee-keepers have testified to the protection afforded by woollen gloves in cases of stinging.)

Thus, in a field of observation which I should never have imagined would repay the trouble of thought or study, is again clearly revealed, on the one hand the remedial protecting virtue of wool, and on the other the baneful effects of cotton. Now, too, I was reminded of something which had always been a mystery to me. Whereas gadfly stings raise great bumps on human beings, which itch and smart for days, upon cattle, that are at times stung by swarms of these flies so as to be covered with blood-drops, no bumps are seen, nor movements denoting itching or desire to rub themselves; directly the gadflies are gone the animal stands perfectly still. Various explanations may be suggested, but the facts are there to speak for themselves.

An extension of the clothing reform to the gloves will confer a very distinct benefit, and the use of the Sanitary Woollen gloves may be recommended to every one who is dissatisfied with the condition of the hands.

PATENTS AND ROYALTIES.

(1880.)

A CORRESPONDENT has written to me:—"Frequently when I argue with others, the answer is to the following effect: 'No doubt there is something to be said for it, yet I cannot bring myself to put faith in the System as you do; besides, Dr. Jaeger is so keen on the subject of Woollen clothing simply as a matter of business; for he gets

a percentage from every one of the woollen drapers and manufacturers.'"

The first condition to induce manufacturers to take up specialities is to protect them by patents, or by registering designs. It is only under such protection that a man of business will feel encouraged to incur the intitial loss involved in the make and introduction of new articles, and subsequently to constitute them an exclusive feature of his trade. Without patents, competitors will at once begin to make and sell goods for which an opening has been secured, and the originator will be damaged, if not ruined.

Inventors who present their discoveries free benefit no one, but do harm to everybody concerned. Firstly, the cause sustains damage, for it cannot be properly advanced ; secondly, consumers suffer, since they can never procure the article on reasonable terms with due regard to quality and workmanship ; thirdly, manufacturers lose, because their earnings are diminished by the difficulties attendant upon a new process of manufacture. Hence it is as a matter of public policy, and not in the interest of individual inventors, that civilized states have very wisely enacted patent laws.

It was on the urgent and repeated recommendation of his Excellency Dr. von STEINBEIS, a gentleman who, greatly to the benefit of the community, has for many years occupied the distinguished post of President to the Royal Central Board of Trade and Industry in Würtemberg, that I, too, resorted to this effectual means of protection for my designs ; and the sequel very soon convinced me that my adviser had counselled well.

The first article patented was the shirt. The result is that, at the present time, both in this and other countries, there are establishments in at least a hundred different towns where it can be bought; and every one of these establishments constitutes a centre of propaganda for the Sanitary Woollen System. Considering, further, that these establishments constantly advertise, it will be admitted that, by patenting the shirt, the System has received a great impetus.

No eloquence of tongue or pen would have done as much in ten years to spread the reform as has been accomplished in one year by patenting the shirt.

Touching the question of royalties, I repeat that it was only the legal protection afforded by my patenting and registering which induced manufacturers to work according to my views. But it is the general rule for inventors to receive royalties from business men working their patents. Had I not done so what would have been the consequence?

A man of business regards a refusal of remuneration, where it may honestly be accepted, as foolish. But since I flatter myself upon looking anything but foolish, I should never have had credit for my disinterestedness. I should have been charged with advocating my theories from mercenary motives just the same; while I should have had no compensation for my time and trouble, and for the scoffing and jeering to which I was at first subjected. Had it been eventually ascertained that really and truly I received no remuneration, some would have laughed at me, while others would have pitied me. Schiller says:

"Denn aus Gemeinem ist der Mensch gemacht,
Und die Gewohnheit nennt er seine Amme."

("Man is born of the commonplace,
And nursed at the breast of habit.")

Whosoever, like myself, dares to attack cherished habits must bear the brunt of all the forces of commonplace vulgarity arrayed against him. It is proverbial that those who seek to benefit mankind are badly treated at the hands of their contemporaries. My maxim is, "Rather be hammer than anvil."

I believe that only thus could opposition have been broken down; and the steady and energetic progress of the Sanitary Woollen Clothing reform, surpassing my most sanguine expectations, is the best assurance that I set about it in the right way.

TAILORS.

(1880.)

INASMUCH as the Sanitary coat is more difficult to make than ordinary ones, tailors do not countenance the reform, and usually oppose it; especially are those tailors prejudiced against the Sanitary coat who make it merely as a supplement to their business in ordinary clothing, as they never acquire sufficient skill to produce an article capable of competing for price and excellence with the ordinary coats. There is the further disadvantage that so-called Sanitary coats continue to be made on wrong principles, with cotton and linen paddings or linings. Of course, when a customer has such a coat supplied to him, he finds it intolerable to wear, throws it on one side, and rails at the System. The report

spreads, people shake their heads and say, "Did I not tell you it would never do? Believe me, the whole thing is a delusion, if no worse!" Thus a single coat badly made may have the effect of checking the progress of the movement in a whole district. Accredited tailors, authorized by me to work from the proper pattern, are frequently at a disadvantage, in that they cannot make the Sanitary coat an exclusive feature, and thereby acquire the highest degree of proficiency. Besides, even in such establishments, *there is no security, so long as ordinary clothing is made there*, and a stock of canvas must be kept for stiffening. A journeyman tailor who cannot bring himself to dispense with the greater ease in working which the addition of the canvas affords, will soon sew some of it into a coat, without his master's knowledge, and a spurious article is thus palmed off upon the public from a duly accredited establishment, causing all the greater mischief.

There is another difficulty I have to contend with. Tailors cannot afford to lose a customer. When I give some special direction which does not approve itself to the mind of a buyer, tailors must either endeavour to persuade him, talking by the hour, or else, rather than waste more time, simply acquiesce. The latter course being more pleasant, and less costly, my directions go unheeded. For example, I am constantly impressing upon tailors never to select too heavy a cloth, and insisting that they should try to dissuade customers from such a choice. Perhaps a tailor will make an effort, but the customer persists; when he receives his coat he feels as hot in it as a fireman at the stokehole of a steamer, and of course, blames the Sanitary Woollen System.

THE CRISIS OF DISEASE.

(1881.)

A TRANSITION from the ordinary style of dress to the Sanitary Woollen System is sometimes attended with phenomena which doctors designate "critical," as indicating a turning point. These "crises," which may occur soon or some time after the change, running their course in a few hours, or enduring for a longer period, and involving greater or less disturbance of the general health, have caused persons who did not understand them to discard the Sanitary Woollen Clothing, especially when the "critical" periods have lasted any length of time. In place of the improvement that was expected from the adoption of the System, people conceived that it made them ill.

Healthy persons who need nothing beyond the elimination of superfluous tissue-water find that the "crisis," as a rule, is confined to one or more copious outpourings of perspiration, occurring in rapid succession, and in a few weeks the full benefit of the Sanitary Woollen System is realized. But where there is a long-standing chronic disorder—be it only a constitutional susceptibility to colds and chills—the case is altered, and for the following reasons.

The earlier physicians believed that in cases of disease and chronic disorders, some special "morbid matter" must first be expelled before the patient could recover. They were familiar with the kind of "crisis" which heralds convalescence, but is preceded by exacerbation of the symptoms, and they termed the attendant secretions, which, as a rule, appear

in the form of perspiration, "critical secretions." They could not, however, explain more precisely the nature of this "morbid matter." The modern school of physiology rejected this theory, or recognised it only in epidemic diseases, and ceased to give the same attention as formerly to the "crisis" of illness.

My researches confirm the earlier views of the profession on this point, and show that the odour of the "morbid matter" exhaled by the patient is characteristic of the particular disease, thus admitting the practicability of recognising a disease by the sense of smell.

I could say much more on this subject, but will restrict myself here to the following remarks.

As I have frequently explained, every living creature, even when healthy, evolves "noxious" emanations from its food and from the decomposition of albumen in its tissues. If these emanations can be freely eliminated, they do no harm, but if their discharge from the body be checked, they will accumulate within, creating what medical men call dyscrasia, or a bad condition of the bodily juices. The same thing will happen in an atmosphere constantly laden with offensive emanations, whether originating within the body, or from any other source. The albumen of the tissues attracts such emanations, and becomes impregnated therewith.

Want of exercise especially favours this process of absorption, rendering sluggish the interchange and conversion of the constituents in the body, the tissues of which then as readily take up odorous exhalations, as standing milk is known to do.

A person whose tissues are thus overcharged with "noxious" emanations may not at the time feel

unwell, for the emanations are, in a manner, chemically combined with the albumen in the tissues. It is the decomposition of albumen, consequent on increased activity of the organs, through some stimulating cause, that liberates the "noxious" emanations, which then become odorous, and illness sets in. The tendency to this is accentuated by the effect of the "noxious" emanations in rendering the tissues more spongy, increasing the quantity of water in them, and assisting decomposition.

The next is a very important point for laymen as well as doctors, and I beg my readers to give it their best attention.

According to my observations, many "noxious" odours, by direct action upon the skin, and by penetration into the bodily juices, produce contraction in the cutaneous blood-vessels, and thereby create a sensation of cold, because the skin in such cases receives a smaller amount of blood heat. The same will happen if internally a "noxious" volatile essence be set free. That is the reason why many illnesses are ushered in with a shivering fit. If this is very pronounced, and is closely followed by the so-called febrile fit, by way of reaction, the effect of the volatile odorous essence above mentioned is no other than the hitherto unaccountable feverish shivering. But if the reaction is delayed, and there is only a moderate degree of shivering, the patient will probably say that he has caught a cold, even when there is not the faintest trace of a cause for the chill. Hence comes that very general view of chills as prime causes of illness, and the consequent nervous dread of catching cold which has wrought, and is still working, so much mischief.

To return to the question of the "crisis." The Sanitary Woollen System has by this time fully approved itself as one of the most powerful, if not, indeed, the most powerful, curative means for dyscrasial habits of body, for the reason that it possesses the faculty of expelling the volatile dyscrasial stuff from the body.

What is the inference? A person predisposed to take cold is one whose dyscrasy or "noxious" essence possesses the special characteristic, whenever set free, of setting up a feeling of chill. If, by the help of the Sanitary Woollen System, this odorous essence be suddenly expelled, the "crisis" will run its course as an apparent fever caused by a cold.

It must be remembered that the "noxious" emanations, in cases of dyscrasial or distempered habit of body, are greatly diversified; and, consequently, the symptoms characterizing these "crises" must be as dissimilar as are the maladies themselves.

In conclusion, I may state that although I have been now wearing the Sanitary Woollen Clothing for the last two years and a half, it was not before the past winter that a certain troublesome irritation of the skin between the shoulder blades quite disappeared. I had been saddled with it for fully seven years, especially during the cold season, and, in fact, it showed even two winters ago, although only as a mild kind of evanescent rash. Therefore, I say, patience! The "salutary" principle which clings to woollen garments—nature's healing power, or the body's inherent medicine—will overcome everything, unless indeed internal anatomical changes have

taken place. Care, however, must be exercised that the remedial action be not interfered with by the "noxious" principle of the body, which adheres to textures of vegetable fibre.

I am satisfied that many who have adopted the Sanitary Woollen System, and who may read this, will call to mind their own early experiences. These remarks will clear up much that may have seemed unaccountable, and it will now be better understood why opinions of the System may at times have been diametrically opposite, according to particular cases and circumstances.

When I was told at first that a person had tried the Sanitary Woollen System but could not stand it, I was fain to conclude that there must be constitutions with which it did not agree, although I rebelled against such a doctrine as an obvious paradox. Now, however, since I more fully understand the character of the "crisis," I no longer entertain the slightest doubt. The Sanitary Woollen System agrees with everybody, without exception, and the very persons whose bodies make the hardest fight against it will ultimately derive the greatest benefit from it. The struggle is proof that "morbid matter" is lurking in the body; and, although for a time this may not cause actual illness, there is a consciousness of imperfect health, which shows itself in this, that, and the other minor ailment; and sooner or later its development is attended with serious, perhaps fatal, results. The reader will, therefore, readily perceive how a "crisis," when misunderstood, may give rise to seeming contradictions in the minds of those who claim to have given the System a fair trial.

WOOLLEN CLOTHING FIRE-PROOF.

(1881.)

THE great difference in this respect between woollen and vegetable fibre is worth noticing. Cases often occur in which the hair catches fire, but it never burns down to the skin, as would certainly happen with vegetable fibre. If a piece of linen or cotton be held over a lighted candle, as soon as it ignites it burns away with a clear flame until nothing remains but the ash. If a similar experiment be made with woollen material, a considerable time will be required before it will ignite at all, and then the flame is extinguished so soon as the material is removed from the lighted candle. Thus people are fire-proof in wool—*i.e.*, their clothing or bedding cannot catch fire; while, when clothed in woven material of vegetable fibre, they are practically torches ready for the lighting.

THE SANITARY WOOLLEN HANDKERCHIEF, AND CATARRHAL INFECTION.

(1881.)

LAST winter, when the severe cold weather suddenly set in, and windows and doors in the living rooms were kept closely shut, the diminished ventilation and heated atmosphere caused all things of vegetable fibre in the rooms to exhale the "noxious" odours which they are constantly absorbing; and whoever, like myself, was condemned by his occupation to remain continually indoors,

contracted what is frequently mistaken for a cold, but in reality resembles the disease called "strangles," with which horses kept in stables are affected—*i.e.*, we did not catch cold, but we were "poisoned" by the atmosphere of the rooms in which we lived.

(I may here remark that I have been reproached for repeatedly comparing the condition of human beings to that of animals. I am compelled to this by the necessity of keeping under my readers' notice the fact that the Sanitary Woollen System does not promise absolutely perfect health and perpetual existence, but only that degree of stability of health which is possessed by the domestic animals.)

I was guided to the above conclusion by the following considerations, which obtained in my own and all similar cases that came under my observation :—I never coughed out of doors, however cold it might be, nor at night, when sleeping with the window open ; the irritation in the throat was only felt when in the living rooms. It was evident from the beginning that the cough originated from the stomach—*i.e.*, a fit of coughing would set in about two or three hours after taking a meal, without any apparent cause. This period coincided with that of the change in the nature of the emanations evolved in the body from the food in process of digestion.

My sons, who skated a great deal and went twice a day to school, were entirely exempted from the disorder in question, and the case of my youngest daughter, who went to school in the forenoon only, was milder than that of my grown-up daughters, who sat at home at their needlework. But the

chief sufferer was myself; for while my family betake themselves at 10 to 11 p.m. to the pure air in the bedrooms, I remain until 2 a.m. in a study filled with books, papers, and other objects, which absorb and exhale the noxious matters in the atmosphere.

I find that the remedy for this disorder consists in :—

(1) Thorough ventilation of the living rooms.

(2) It is an old rule that catarrh will be sooner cured if the handkerchief be changed as often as practicable. This must be due to the presence in the used handkerchief of an infectious agent which renews the catarrhal complaint; and herein lies a striking confirmation of my theory respecting the effects of the "noxious" emanations.

I reasoned that this infectious agent must be the well-known characteristic odorous matter of handkerchiefs used by catarrhal patients; further, that this "noxious" emanation would be absorbed by vegetable, but not by woollen fibre. In order, therefore, to obtain relief from the disorder, after it had annoyed me for four weeks, I resolved to try the woollen handkerchief, which had already been introduced by adherents of my Sanitary Woollen System, although I had hitherto objected to it as impracticable. This objection I withdraw, and I acknowledge my error. In three days I was freed from the nasal catarrh, and by the fourth day the cough had disappeared; only the mucous membrane of the throat was not completely in order. I may add that, so far as I could learn, no "hardened" wool-wearers thus attacked experienced feverish symptoms, or were interrupted in

their ordinary avocations. For instance, when the disorder was at its height I was able, on one occasion, to dictate for seven hours at a time; on another, to lecture and discuss continuously from 7 p.m. to 2 a.m. in a thick atmosphere of tobacco smoke.

Since I have adopted the woollen handkerchief the nasal secretion has become quite normal—*i.e.*, has almost ceased, but the catarrhal affection of the throat and larynx remained almost unchanged, until one day a light dawned upon me. I had for years smoked a pipe consisting of a clay bowl and a simple reed stem, and it occurred to me that, just as the handkerchief of vegetable fibre preserves the infection of nasal catarrh, so the pipe stem of vegetable fibre might retain the infection of throat catarrh. Therefore, if my theory were correct, by substituting for the pipe with the reed stem one with a horn mouthpiece the continuous self-infection would cease. This surmise was completely justified by the result. A few days after the change from the wooden to the horn mouthpiece the catarrh disappeared from my throat, and the voice was restored. Various tests have further established the noxious quality of the wooden mouthpiece. Inhalation from it distinctly retarded the rapidity of the movements of the nerves, as measured by the stop-watch (see page 7), and I have several times made the experiment of smoking through it again, but invariably with an irritating effect on the throat. This effect, however, passed off again at once, which is important evidence that the infection does not arise from disease germs, but from odorous matter.

THE ADULTERATION OF WOOL WITH COTTON.

(1881.)

THE surest mode of detection is by microscopical examination. With a thirty-fold magnifier the least admixture can easily be recognised. The woollen thread appears as a cylindrical body of almost circular shape, with wavy outline; the cotton thread appears flat and ribbon-like, with angular folds, as if crumpled.

A second test, which any one can apply, is by holding the separated warp and woof to a flame. Pure woollen thread fuses to a shapeless mass before it is consumed, leaving a shapeless ash, and extinguishes directly it is removed from the flame; cotton or linen thread burns steadily on after removal from the flame, and the form of the thread is distinctly preserved in the ash. If a thread be an admixture of wool and cotton, it will burn irregularly.

THE AIR IN ROOMS.

(1881.)

THE injurious effect of the air confined in rooms is one of the oldest and best known themes of sanitary science. Writers on health abound with advice as to ventilation, the keeping as much as possible in the fresh air, and so on, and my readers know the importance of sleeping at night with the window open. Therefore, in making the following suggestions with reference to the air in rooms, I

am only pursuing and extending the ancient track. I have now (autumn, 1881) had three years' experience of the Sanitary Woollen System, and I can safely say that it has answered the expectations formed of it. It is a powerful remedy, and, when the body is hardened, maintains those who adopt it in as sound health as, for instance, the horse, or the house dog. More than this cannot be demanded of any system by those who dwell under artificial conditions, within four walls. But the improvement implied by the above comparison will be patent to every one who knows how much less often the dog is ill than its owner.

To laymen, at the beginning, the Sanitary Woollen System may have seemed as if it would accomplish even more than this, but medical men know that all systems of cure and rules of health, such as the use of special baths, change of air, change of diet, etc., work much more energetically at the commencement than when the body becomes accustomed to the altered conditions. The reason is that the bodily machine at once seeks to restore the equilibrium thus disturbed, and to this end works more rapidly, causing freer and more complete exhalation of the "noxious" vapours. The consequent improvement in health at the commencement should not be allowed to mislead, as the value of a rule of health can be first estimated when the body is accustomed to it.

This stage in the Sanitary Woollen System has now been reached by many, and the conclusion arrived at is, that the System procures that addition of health for which man has hitherto had every reason to envy the domestic animals; but the

wool-wearer shares with the domestic animals those diseases which are the *raison d'être* of veterinary surgeons. The question now to be asked is, Cannot matters be carried any further? Again the animals supply the answer, and most plainly.

I describe the wool-wearer as being as healthy as a horse or a dog, or more precisely, as housed cattle; a higher degree of health is attained by grazing cattle—for example, by sheep. These are much less subject to diseases due to the personal "noxious" exhalations—for instance, wool-wearers do occasionally catch cold in the same way and for the same reason as housed cattle, while grazing cattle are absolutely weather-proof; but the latter are not proof against infectious diseases, although the fact that sheep are more so than oxen was impressed upon the soldiers in the Franco-German war, who had for that reason to subsist on mutton. That the sheep is infected with very dangerous parasites does not affect the argument, for all wild animals have parasites.

To what is the higher degree of health of grazing cattle due? Simply to the cause that makes our soldiers healthier during the month of the manœuvres than when they are penned in barracks. Grazing cattle constantly bivouac, at least in summer, and are not poisoned by the air of their stable. Yet a degree higher in health than grazing cattle are ground game (hares, foxes, deer, partridges, pheasants, etc.), which also bivouac in the winter. These animals are not only weatherproof, but epidemics are much rarer with them than with grazing cattle; still, however, such diseases do occur, and it is very interesting to inquire the reasons,

which will be explained by the following two facts :—

1. Animals which live *on* the ground are more proof against epidemics than animals which live *under* the ground ; for instance, field mice are subject to violent epidemics, which will destroy nearly the whole of them in a district ; and this occurs when the mice are so numerous that the whole ground smells of their excrement, and is therefore saturated with poison proceeding from the mice themselves.

2. The birds in the air are absolutely infection-proof. I have never heard of nor seen an epidemic among crows, jackdaws, sparrows, starlings, swallows. The only diseases to which they are subject are from lice and worms ; and they sometimes suffer from predatory animals, frost, hail, etc. Their "self-poison" is mainly contained in their excrement, and with this they hardly ever come in contact, while they are removed from every kind of miasma of the ground.

Now comes the question to what degree of health man may hope to attain, having regard to existing circumstances and customs, and without heavy expenditure ; in other words, without building castles in the air, or seeking to inhabit balloons, as he would require to do to become as healthy as the birds. This condition is, therefore, unattainable ; and here, as everywhere, to demand perfection generally leads to realizing little or nothing. Those who have followed my suggestions as to Sanitary Woollen Clothing and Bedding and sleeping with open window have reached a degree of health equal to that of the horse ; the next degree, and the only one practicable for discussion, would be health equal to that of sheep.

The experiences of this winter (1881-2) give me the firm assurance that this is tolerably easy to attain, for it is merely a question of the atmosphere in living and working rooms, respecting which I am in a position to say something more radically helpful than my predecessors on the subject of ventilation.

Before coming to the practical side of the question, I must again institute a comparison with the domestic animals. If they be classified according to the facility with which they contract disease, the lowest place must be assigned to stalled cattle, the horse and the ox, who live in the same space in which they deposit their excrement. Why does the dog possess more power of resistance to disease? Because the dog is cleanly indoors, and does not, like stalled cattle, subject itself to the injurious influence of the odour of its excrement; while chained dogs, who cannot get away for the purpose, are not confined in close rooms. The greatest strength of resistance, and the toughest nature of all, has the cat, which carefully buries its excrement, and is not confined to the atmosphere of rooms, or chained to miasmatic ground, as dogs frequently are, but seeks the airy and lofty parts of dwellings. These considerations show that the worst enemy to the health of every being is found in the mal-odorous portion of its own exhalations. This is most readily apparent with respect to sewage, and the attention of sanitary authorities has been rightly devoted, in the first place, to the removal of this notorious "self-poison." I may, however, point out that the plan of the cat, which buries its excrement *immediately*, is better than that of allowing it to ferment and distil, so as to give out a maximum of odour.

That the atmosphere in rooms which are inhabited, even when no air from drains, etc., forces its way in, soon becomes loaded with "self-poison," has, of course, long been recognised; but much too little attention has been paid to the fact that these exhalations are not only dispersed in the surrounding air, but are also caught up and retained by the objects in a room, to be again, on occasion, given out. So long as a dwelling-room is abundantly ventilated there is no danger, and followers of the Sanitary Woollen System are in this respect much better off than those who are mis-clothed; for they can not only sleep with open window, but also, as they are not afraid of draught, and have less need of external warmth, can work with open windows and doors. I may here remark that while the air in a room remains, through ventilation, free from poison, its temperature may, without becoming too cold, sink much lower than when, in the absence of ventilation, it contains poisonous matter; "self-poison," in fact, chills, and I know wool wearers who work in winter by open window, which is the right thing to do.

The difficulty begins when the cold necessitates warming the rooms; proper ventilation then becomes expensive, for the warmth escapes simultaneously with the vitiated air, so that most people resign themselves to the inevitable, keep their windows shut, and live in a stuffy atmosphere.

I believe that the danger thus incurred would be greatly lessened if all those objects were removed from the room which absorb the noxious exhalations. If they would *retain* them, their presence would be a benefit, but warmth and damp cause them to give these exhalations out again, and they are and remain

mal-odorous. After a close examination of the subject, I am in a position to denounce the unwholesomeness of the dust in rooms. It is only necessary to inhale the odour under a piece of furniture, whence the dust is not regularly removed, to be convinced of this; or to compare the very different smell of the atmosphere of a room before and after the latter has been thoroughly cleaned and dusted out. Further consideration of what constitutes the dust in rooms shows that this offensive smell is less that of the dust particles *per se*, but has in a much greater degree been taken up by them.

The following are mainly the constituents of the dust in the rooms :—(*a*) Earth dust : We know that the earth readily absorbs odours, and gives them forth again under the influence of warmth and damp, hence the dangerous ground miasmas. (*b*) Coal dust : Coal has such strong absorbing power that it has long been used for deodorization ; it seems to retain odours more firmly than earth dust, but still coal dust cannot be considered harmless. (*c*) Vegetable fibre dust : This proceeds from the linen and cotton materials of clothes, etc., and from the droppings of horses, etc., in the streets, also from the wear and tear of floors and wooden objects. It is clear that vegetable fibre dust must act in a similar manner to vegetable fibre in clothing.

Dust thus constituted cannot but be most dangerous company in a room, as, if allowed to remain, it becomes poisonous, and, when it is disturbed and enters the lungs, has not only an irritating effect, but, becoming moist, gives out its noxious odours within the body. The disagreeable odour when a dusty floor is wetted is well known, and a damp

atmosphere suffices to let loose the smell. Hence follows the recommendation not only to remove the dust of rooms as often and as thoroughly as possible, but also to adopt certain methods of doing it. In dealing with the dust in rooms most ladies and their servants make three mistakes.

The first is that the dust is more driven about the room than actually removed. If a room of which the windows are closed is swept out, and the furniture wiped down, it looks comparatively clean, but is nothing of the sort, because a large portion of the dust has deposited itself on the walls, and on projections, such as picture-frames, mirrors, etc., between the books on the shelves, and behind the heavier furniture standing against the wall. Nor are things much improved by the opening of one or more windows on the same side of the room. What is wanted is a thorough draught of wind; and if a room has only windows on one side, a window in the passage or elsewhere should be opened to cause such a draught as will really carry the dust out of the room. Windy weather is, of course, best for this purpose, to which I attach so much importance, that I would recommend the sweeping out of rooms to be deferred when, in the absence of wind, it is impracticable to create a good draught.

An important help in getting rid of the dust by means of the wind is to attach a large piece of pasteboard to a wooden handle, and, after the room has been swept, to stir the air, driving the minute dust out of the corners and angles, away from the walls, preventing it from settling anywhere, until the room *smells* free from dust. No sense can be so relied on for accuracy in this respect as that of smell: long

after no more dust can be seen the nose will detect it.

A second mistake is the belief that through moisture (tea-leaves on carpets, or a damp cloth on wooden floors) the dust is prevented from rising, and is removed.. Some, of course, is removed, but only such as is on the floor, and that not entirely. The fine dust, clinging to the walls and ceiling, can only be dealt with by stirring the air, as just described. And it is this fine dust which is most dangerous, for it consists of the specifically light organic matters, while the heavier mineral dust sinks on the floor. The third mistake is the habit of overlooking the dust which is more difficult to get at, behind furniture, pictures, mirrors, and so on. It is only necessary to smell at these places to be convinced how they must assist to vitiate the atmosphere. The removal of such dust would be easier if all furniture stood on castors; but if furniture be not placed quite close against the wall, a stick may be introduced to loosen the dust, etc., so that it may be driven out when the air is stirred.

Another point with reference to the atmosphere in rooms is connected with the flooring and the furniture. Proofs of how eagerly and freely offensive odours are absorbed by wood, which gives them out again whenever wetted, are open to any one who likes to try the simplest experiments. I have no longer any doubt that wood of which the surface is not painted or polished takes up the exhalations of the body in the same manner as do textures of vegetable fibre when used as clothing.

Every one is acquainted with the disagreeable smell of a room in which is rough woodwork, such

as register boxes, deed-chests, book-stands, and the like, in (German) government offices. The general ill-health among those who work in these offices, which is ascribed to the sedentary nature of their labour, is certainly not attributable to that alone, but also to the exceptionally bad atmosphere, mainly caused by the very old wooden lumber, charged with evil odours.

All woodwork in rooms, including furniture and flooring (the former not only externally and in front, but also internally and at the back), should therefore be treated with varnish, oil paint, linseed oil, or some similar preparation, which will have the effect of closing the pores of the wood. One of the most important sources of lurking self-poison will thus be removed.

Not a few people object to sitting on upholstered furniture; some find it too warm, others have no further reason to give than "the unpleasant feeling." Now, all so-called "feelings" proceed from odorous matters, and the materials of vegetable fibre in the stuffing of a well-used piece of upholstery will be found on examination to emit a repulsive smell. Here, therefore, is another source of vitiated atmosphere in living-rooms, which makes itself felt directly the windows are closed. Indeed, the seeds of disease may lurk in upholstered furniture. A medical friend has related to me the following incident. He was attacked by a disease, at first inexplicable, but afterwards declaring itself as the form of intermittent fever prevalent in the tropics, and he was for a long time quite unable to discover the cause. On a subsequent professional visit to the house of a clergyman in his district the matter

was explained. The clergyman, previously an African missionary, incidentally mentioned, pointing to an American chair, that he had lain in it, in Africa, for two years, ill with intermittent fever. Shortly before my medical friend's attack he had had occasion to sit in this chair for a considerable time.

My sister, resident in New York, has told me that one of the best-known German physicians in that city once remarked to her that no house ought to be inhabited for more than sixty years, but should then be pulled down, as it is infected by all the diseases of those who have ever dwelt there. He was right ; probably every reader has at some time or other, on entering an old house, full of woodwork, been struck by the unwholesome smell. What is then to be done ? My readers will scarcely reconcile themselves to the radical remedy suggested by the American physician, nor do I consider it necessary. If all plain wood were to be thoroughly oiled or varnished, I believe that old houses would no longer be haunted by such evil spirits. As regards ordinary upholstered furniture, it would be a great step in advance to discontinue its employment in the rooms usually inhabited, and if new upholstery be procured it should be "Sanitary Woollen." I have had the furniture for my daughter, on her marriage, made in this manner by a firm of upholsterers here, and find that it is easy to effect, without adding to its cost or detracting from its appearance. Ordinary upholstery can also be altered to "Sanitary Woollen." I particularly caution against old upholstered heirlooms, to which the remarks of the American physician respecting houses quoted above, are entirely applicable.

In conclusion, I must inflict a deep wound on the housewifely heart. If the nose be applied to white window-curtains, even after they have been up a very short time, they will be found to smell like "dirty wash," and are therefore just as prejudicial to the atmosphere in the room. Whoever can afford it should have woollen curtains, and whoever cannot has the economical alternative of dispensing with curtains altogether. I have never permitted their presence in my study, and therefore know from experience that they are not necessary.

COLD BATHS.

(1881.)

FROM time to time I have encountered persons who declared that the Sanitary Woollen Clothing did them no good, but made them languid and nervous. At first I attributed this to the early stage of their experience, but when similar complaints were made in cases where the System had been adopted for twelve months, it became clear that there must be some other cause. I am indebted for the discovery of this cause to my attention being drawn to the fact that similar symptoms are constantly found in cases of excessive use of shower and other cold baths. On inquiry, I ascertained that all those who had made the above-mentioned complaints regularly took such baths. Before I advocated the Sanitary Woollen System I had spoken against the too frequent use of so strong a stimulant, and this especially applies when Sanitary Woollen Clothing is worn. The latter attracts

the blood to the skin, which is good, and cold baths do the same thing for a short time; but the combined effect is bad, just as two good meals, taken together, would be unwholesome. For wearers of ordinary clothing cold baths are beneficial, when not used in excess and too regularly, because the linen or cotton shirt has the bad effect of driving the blood away from the skin. To such persons the cold bath affords an increased circulation of blood at the surface, at least for a time. But *dry* woollen clothing, after a cold bath, causes such a flow of blood to the surface that the supply to the brain and the intestines is impoverished. We here again see that nature's laws must be respected. The wearer of Sanitary Woollen Clothing must take pattern by the woollen-coated animal, which does not throw off its clothing, go into cold water, dry itself, and then resume its dry clothing, but goes, coat and all, into the water. The cooling effect of the evaporation set up through the drying of the wet coat on the body counteracts the excessive tendency to expansion of the surface blood-vessels; and it is precisely to this evaporation that is due the lasting refreshing effect of the bath. Let the wearer of Sanitary Woollen Clothing follow this example, and, if he wants to be refreshed, wet his fleece. The body should not be dried, and in warm dry weather the shirt should be dipped in the water, or sponged over, and then the dry overclothing put on. The effect is most pleasant, affording an enjoyment from which the wearer of linen or cotton is debarred, and preventing the languid feeling often experienced after bathing. But here again moderation is a golden rule; as already explained wool-wearers do not

require the cold bath for its stimulating effect; while, as the secretions pass freely away in vapour, instead of being turned to water on the skin, the latter remains clean and wholesome. Wool-wearers should therefore study their feelings in the matter, and be guided by them. Summer bathing in the open, should be on the same plan. The shirt should be kept on, or wetted before it is resumed; the best bathing costume is a combination-garment of short-sleeved shirt and short drawers, fitting closely, and made for the purpose. The bather simply keeps this on, and, after pressing out the surplus water, draws on his outerclothing.

This wetting of the underclothing will be found a capital substitute for the refreshment of a bath when such cannot be had.

To allay uneasiness, I may remark that experience has long shown that pure woollen clothing, when wet, may, without any injury to the body, be allowed to dry on it. A constant proof of this is afforded by the woollen clothed fisher population on the shores of the Baltic, who are noted for their splendid health.

THE SOCK OR STOCKING.

(1881.)

I HAVE often been requested to devote attention to this article of clothing, and I believe that I am now in a position to give full technical directions respecting it.

I formerly attributed to the faulty construction of the shoe the troubles to which the feet of civilized mankind are subject. I therefore devised the Sani-

tary Woollen shoe, and only required of the sock or stocking that it should be woollen. The low partition which I introduced into my shoe to separate the great toe from that next to it, and to keep the former in its proper position, whereby its powerful and heretofore disused muscle was brought into play in walking, first caused me to examine the subject of the stocking more closely. I remarked that the separation of the flesh of the great toe from that of its neighbour had a very advantageous result. Perfect cleanliness of the feet is most difficult to maintain between the toes, where the two surfaces are pressed together, inducing an offensive condition of the skin quite different from that of any other part of the foot.

The freer exhalation secured by the Sanitary shoe had improved the condition of my feet, but the skin between the toes could not be said to be restored to a wholesome state. Between the great toe and its neighbour, however, which were separated by the little partition referred to above, and by the fold in the stocking which this caused, the cleanliness was perfect. I considered that this must be due to the inside surfaces of the toes no longer being in contact, and I remembered that persons who suffer much with their feet find great relief from wrapping a rag round each toe. I was thus led to design a sock with a separate receptacle for each toe, as in a glove.

I have now worn this sock for about three months, and can say that it completely attains its object. The skin between all my toes has become as clean and normal as that between the fingers of the hand ; all matter of offence has departed, and the toes are much more supple. The improvement is not

confined to the toes, but extends to the entire sole, particularly to the fore part, where formerly, if I walked much, I always suffered. During my last foot tour I felt nothing of this, which I attribute to the ventilation channels afforded to the sole by the double layer of wool between each toe.

I can therefore strongly recommend this form of sock or stocking to every one who is dissatisfied with the condition of the feet. In cases where two or three toes have grown together, a special construction of sock is, of course, necessary. There need be no fear of these divided-toe socks necessitating unduly broad shoes, if the former be not made too thick. Lastly, there is the objection that such socks take longer to draw on over each separate toe. This is so at first, but practice soon puts that right, and even if an extra minute be consumed, it is not too much to pay for the pleasure of having the skin between the toes as pure and wholesome as that between the fingers.

THE NATURE OF DISEASE.

(1881.)

IN many cases, of the most various description, the seat of disease will be found in the non-sanitary clothing and bedding rather than in the body of the patient. It is an important fact that not only the so-called infectious diseases, which originate through germs, can be conveyed in the clothing, but also diseases with which germs certainly have nothing to do.

Clearly, when the seat of the disease is in the

clothing or bedding, all medical treatment is useless which is only applied to the body. There are cases which often seem desperate of cure; such as, to name the simplest of them, the numerous nervous complaints, especially of women, the not less numerous diseases of the digestive organs, and chronic catarrh in the breathing passages. The cures which the adoption of the Sanitary Woollen System works in these disorders are sometimes called miraculous; but the only matter for astonishment is that these simple diseases have hitherto defied successful treatment.

A consideration of great practical importance is that the faculty of conveying the whole class of diseases in question extends even to subsidiary articles of clothing, such as handkerchiefs, chemisettes, aprons, etc., when the material is of vegetable fibre.

In assisting my readers to a deeper insight into the nature of these disease-poisons, and to the practicability of their being conveyed through the clothing, I assume their acquaintance with what I have elsewhere pointed out. Vegetable fibre has the faculty of retaining disease-poisons, which, however, do not remain in animal wool. I also assume that my readers remember my distinction between the "noxious" mal-odorous exhalations of the body which vegetable fibres absorb, and the "salutary" fragrant exhalations which animal wool attracts.

In order to understand the nature of disease, it will be well to inquire, In what does poison consist? The answer is that *every thing*, even the salt which we consume daily, and which is an important constituent in our bodies, can become poison. The question whether any substance is a poison or not is

simply one of quantity or concentration ; and the reason why certain substances are specially termed "poison" is that such are poisonous in very small, while others are only so in very large, quantities.

As regards the nature of this poisonous action, the ultimate consequence is, of course, the destruction of life ; but the practical question is, how to tell whether a substance, if its action be unimpeded, will destroy life ; in other words, What are the first effects of a poison ?

Science has not completely solved this problem, and only knows the symptoms produced by special poisons, such as arsenic, lead, laudanum, prussic acid, etc., but has no *general* characterization.

There have been no means of ascertaining the presence of poison until it has reached a dangerous degree of intensity ; and thus the opportunities of studying the symptoms have been exceedingly rare.

My plan of nerve-measuring supplies such opportunities, so that in the simplest manner and at any time, without incurring danger or needing the help of chemistry, any one may ascertain whether a thing be poisonous or not.

The final effect of poison is death, *i.e.*, cessation of the voluntary (as well as of involuntary) movements ; the *first* effect is the protraction of the voluntary movements. Therefore, in order to know whether any thing is poisonous, it is sufficient to measure the rapidity of the simplest accustomed voluntary movement (for instance, the time required to effect a pressure with the finger several times in succession) at regular intervals of time ; then the odour of the object under examination should be inhaled during ten to fifteen minutes, measuring meanwhile the

rapidity of the finger-pressure every ten seconds. If the substance be a poison, the rapidity of the movement, either immediately, or after a preliminary increase of short duration, declines with a quickness in proportion to the dangerous nature of the poison.

When the medical profession have once recognised the importance of the discovery, I believe that my method of nerve-measuring will find wide practical use for this purpose. In my own practice it is of inestimable service.

Now arises another question :

There is no doubt that wild animals distinguish things which are poisonous from those which are not, without the aid of a nerve-measure. How do they accomplish this? By smell. Here I must again diverge.

If from any substance soluble in water or spirits of wine a series of solutions of different degrees of dilution be prepared, the test of the nerve-measure will show that some one of these solutions leaves the rapidity of the finger-pressure unaffected. This may be termed an "indifferent" concentration. All more concentrated solutions, in proportion as they are more strongly concentrated, protract the finger-pressure, thus showing a poisonous effect. On the other hand, the more diluted solutions, in proportion to their dilution, quicken the finger-pressure ; this may be described as an animating effect, which may be enhanced to a remarkable extent by continued diluting.

If the odour of each of these solutions be inhaled, that of the "indifferent" concentration will be found not to affect one way or the other ; the odour of the stronger concentrations, however, will be

more or less repulsive, while the odour of the weaker preparations will be pleasant and fresh in proportion to the degree to which these are diluted.

Or another experiment may be tried. If a pleasant odour be concentrated, as by filling a room with strongly-scented flowers, before long the perfume will have become repulsive. For this reason, flowers should not be tolerated in bedrooms. The sleeping person not only absorbs the oxygen of the air, but also its odorous elements; and the juices of the body will thus gradually be permeated by flower perfume until a poisonous degree of concentration is reached.

If, on the other hand, a series of solutions of a mal-odorous substance, of different degrees of concentration, be prepared, the odour of the strongly concentrated solutions is offensive, then comes the "indifferent" stage, while the weaker solutions have a pleasant odour, which becomes finer as they are more diluted. Makers of perfumery are well acquainted with this fact, and manufacture the finest perfumes from most repulsive material. Again, the odour of a substance may, when first inhaled, be fragrant, and yet be poisonous—for instance, spurge-olive (*daphne mezereum*) or prussic acid. The true effect, however, is felt if the inhalation of the odour be continued. Suddenly the fragrant impression is reversed, the odour becomes repulsive, and we know that the thing is poisonous. We need only observe the behaviour of animals. If something unknown be thrown to them, it is long and thoroughly smelt, exactly as I proceed when testing with my nerve-measure. Only when after prolonged inhalation the odour remains pleasant, will animals consent to

eat unknown things, while, if the odour changes, the thing is rejected ; therefore an animal can only be induced to take poison when this is concealed in something with which it is familiar, and which it therefore considers unnecessary to test ; or the poison must be so wrapped up that it cannot be smelled.

In short, poison is whatever has a repulsive odour, and all volatile matters smell repulsively so soon as, by inhaling them, their concentration in the juices of the body exceeds a certain height.

With these preliminary remarks, I will now address myself to the solution of the question with which I started. The human body produces incessantly volatile matters—odours—which may be smelled. These are not of themselves poisons, but normal constituent parts, or products, of the body, which, indeed, when sufficiently diluted, may, from their animating effect, be very useful constituents of the bodily juices. These odours, however, become poisons so soon as the degree of their concentration in the bodily juices exceeds a certain height. Unsanitary clothing and bedding are quite enough to produce this effect, particularly in badly ventilated rooms.

The body continually exhales through the skin and lungs these odorous matters, which are readily absorbed by clothing made from material of vegetable fibre. The astounding quantity of repulsive odour which such clothing will take up may be shown by removing the cotton padding from under the armpit of a coat which has been long worn, slightly wetting it, and passing a hot iron over it.

If the odorous matters were firmly fixed in these textures, they would be less dangerous, but every

minute increase in temperature, and especially every moistening of the material, causes them to evaporate.

A portion rises with the warmth of the body and is again inhaled, and another portion mixes with the air under the clothes, interfering with the exhaling action of the skin. Thus the concentration of these odours in the juices of the body reaches a point at which they are poisonous.

I must here refer to the tendency of clothes to store up odorous matters.

If at night water be placed in a dish or bottle in a closed, occupied sleeping room, the water next morning will taste and smell abominably. The popular explanation, that the water has lost something, is wrong. The water has become permeated by the poisonous exhalations in the room. This not only happens to water but also to all vegetable fibre in the room. The linen or cotton shirt lying on a chair near the bed absorbs these odours throughout the night precisely as does the water, and the same thing goes on in the drawers and cupboards in which the so-called clean linen is lying. It is generally thought that when linen has been washed it must be clean ; but scarcely has the linen been made, by washing and wringing, to yield up a part (not even the whole) of the odours it has absorbed, and is neatly laid away, than it begins again, if placed in occupied rooms, to absorb a fresh stock of poison, before it is worn. Whoever doubts this should take any linen or cotton garment, which, after being washed, has thus been lying by for some time, or a linen or cotton curtain with which no one has come in contact ; if the

garment or curtain be wetted and ironed an offensive odour will be exhaled from it. The tendency of a substance to become more volatile in proportion to the warmth of the air, and inversely, to be precipitated and to deposit itself somewhere when the atmosphere is colder, is partly the reason that the summer is a healthier season than the winter. In summer the odorous matters are dissipated in the air, where they are destroyed by electricity, or are washed by the rain into the ground, which readily absorbs them, or are consumed by the leaves of plants. In winter, on the other hand, these odorous matters sink, especially at night, when the room is cold, like dew, into all materials of vegetable fibre, such as linen and cotton clothing, etc. A shirt which was not so permeated with "noxious" exhalations as to have been unwholesome when its wearer took it off in the evening, may attain this degree during the night, and when it is afterwards warmed upon the body the mischief is set loose.

Conversely, the bed may, as long as it is occupied, be free from the above-named concentration, but the air may be full of odorous matter, which, if the window be not opened immediately on rising, will sink like unwholesome dew upon the materials of vegetable fibre in the bed, in proportion as the latter cools. When the bed is next warmed by the body of its occupant the mischief is again set loose.

I would ask my German lady readers what they suppose happens when the beds are placed during summer in the sun, as is the practice in Germany. If they do not know I beg of them to use their noses, and they will find that the doubtful—if not

offensive—smelling bedding has acquired in the sunshine a fresh, pleasant smell, and the next night's sleep is most refreshing. The sun, by expelling part of the odorous matter, has converted or diluted the poisonous degree of concentration into a degree that is not poisonous, and the effluvia into fragrancy; but the pleasure is of short duration, as the old degree of concentration is soon reached again. In summer this does not matter so much—the bedding can be again placed in the sun—but in winter this is impracticable. Thus, in winter, when the sparrow on the roof is as healthy as in summer, so many human beings, however cleanly, are, through the evil emanations from their beds, chilly, sickly, troubled with cough, headache, vapours, palpitation of the heart, rheumatism, and, perhaps, worse complaints still; out of humour, poisoned, and—poisonous. The simple remedy is to throw away sheets, quilts, counterpanes, etc., to sleep in and on pure wool *only*, and to ventilate the room by opening the window before going to bed.

THE SANITARY WOOLLEN BED.

(1882.)

THE Sanitary Woollen System requires that the materials of the bedding and clothing shall consist of animal fibres only. As regards the stuffing of mattresses and pillows, feathers are good and sanitary, but are only admissible in pillows, and even these are too soft, and too apt to work

through the felt covering. For the stuffing of mattresses, only two materials are practicable—horsehair and wool.

The horsehair of commerce is assumed to be animal fibre, but considerable deception on this point is practised by unprincipled dealers. These pay, perhaps, 3s. per lb. for horsehair, and probably not less for oxen and cowhair, which would do equally well. When, therefore, professedly horsehair mattresses, weighing 25 lbs., are sold at from 75s. to 90s., how can the contents be pure animal hair? Where would be the profits of the dealer and the manufacturer? There are various vegetable substitutes which so resemble horsehair that they can only be distinguished from it by the closest examination—for instance, the so-called shadow grass; and unadulterated horsehair is nowadays even more rare than unadulterated wine. This uncertainty, and the much higher price of horsehair, led to the selection of wool as the material for stuffing the Sanitary mattress.

Here, however, other obstacles arose. Only carbonized wool—*i.e.*, from which all admixture of vegetable fibre has been chemically separated and destroyed—can be relied on as pure. Even among the raw material are scattered bits of straw, and hay, and burrs. But mattresses stuffed with carbonized or raw wool would not be sufficiently elastic, and would become, after short use, as hard as boards.

The present manufacturer of the Sanitary Woollen bedding had, however, been accustomed to furnish wool-stuffed mattresses, although inclosed in a linen ticking, as completely and lastingly

elastic as the best horsehair mattresses. This stuffing was provided from tailors' clippings (therefore, of unworn clean material), coarsely shredded. By forming this material into balls, which are placed close together and surrounded by carbonized wool, an excellent elastic stuffing is obtained. Until I entered into relations with this manufacturer, tailors' clippings of mixed materials, as well as those of all wool, were used indiscriminately to stuff mattresses. At that time I had a clear perception of the sanitary effects of wool, but I was not so well acquainted with those of linen. I knew the benefits of wool, but had not fathomed the pernicious qualities of vegetable fibre. I considered it sufficient if (1) the coverings, (2) the mattress ticking, (3) the upper layer of mattress stuffing, were of pure wool, and I saw no disadvantage in vegetable fibre being mingled with the innermost stuffing of the mattress.

So soon, however, as I obtained the necessary insight into the injurious influence of vegetable fibre, even when not actually in contact with the body, I required that such of the tailors' clippings as were not of pure wool should be carefully sorted out. To this the manufacturer agreed, premising, however, that it was impossible absolutely to insure that no clipping adulterated with cotton, or with tailors' thread sewn in it, would escape the attention of the sorters. These clippings cannot be carbonized, as the process is only practicable with half-woollen material, in which one thread is all wool and the other all cotton ; the destruction of the latter by carbonization leaves only the separate woollen threads, which easily dry. But when cotton is mixed with each thread of the material,

carbonization does not cause the web to fall to pieces, and the consequent difficulty of drying the material makes the process too costly and troublesome. The absolute purity of the stuffing of the pillows is even more important than that of the mattresses, and it is hoped that this at least can be secured.

In view of the difficulty of procuring pure woollen stuffing material, I suggest that worn-out pure woollen clothing should be washed in water, pulled to pieces, and preserved in linen bags (for fear of moth) until sufficient has accumulated to stuff a pillow or a mattress. This material has the additional advantage of being permeated by the "salutary" principle which I have elsewhere described as the body's inherent medicine; and worn-out pure woollen clothing is therefore especially suitable and wholesome when thus used as stuffing for the mattresses and pillows of its former wearers.

THE PLATINUM LAMP DEODORIZER.

(1882.)

I HAVE long felt that the difficulty of properly ventilating living rooms in winter constitutes a principal obstacle to the practical carrying out of my system, which, in addition to its title of "Sanitary Woollen," may be termed a "Pure Air," or "Anti-offensive Odours System." I was therefore anxious for the experience of the past winter, as, hitherto at that season, the confinement indoors had invariably led to my being troubled with a cough, although every year in a lesser degree since

I adopted the Sanitary Woollen System. This winter the cough made no sign until Christmas Eve, when I read aloud to my family uninterruptedly for nearly three hours, from a new book. Towards the end of the reading I became hoarse, and the next morning the old trouble in the throat had reappeared. There would be nothing very remarkable in my having become hoarse after reading aloud for three hours, but for my experience of a fortnight previously, when I had lectured on two consecutive days at Mülhausen and Basel, respecting the Sanitary Woollen System. On the first day the conversation, lecture, and discussion lasted almost without interruption from 2 p.m. to 3 a.m., or thirteen hours; on the second day, from 11 a.m. to 1 a.m., or fourteen hours; yet I was in no way rendered hoarse by these exertions. It was therefore clear that there must be some other cause for the hoarseness on Christmas Eve than the mere mechanical exertion of the organs of speech. When I referred to the circumstance the next day, my daughter, who attends a weekly meeting for the purpose of reading aloud, remarked that hoarseness sets in much sooner in reading aloud than in ordinary speaking, and she attributed this to the smell of the paper. This observation served to explain to me the sudden affection of my throat, and to afford another confirmation of the injurious effects of vegetable fibres on the health. I was thus led to consider in what manner I could improve the unwholesome atmosphere engendered by the mass of papers and books with which my study is crowded; and my glance fell on a small object which had stood in my room unused for nearly

two years—the spirit lamp, with platinum spiral, constructed by the well-known DÖBEREINER.

The lamp was recommended to me some time ago as a contrivance for sustaining the diffusion of perfumes in the atmosphere of rooms, and I intended when I purchased it that it should diffuse odours by which I might illustrate my lectures, but I never happened to make the experiment. I now, however, determined to use the lamp in order to disperse about the room that admirable agent for destroying odours—ozogen—and the result quite exceeded my expectations.

The instrument in question is an ordinary glass spirit lamp, with a spiral-shaped thread of platinum encircling the upper end of the wick. When the lamp is lighted it burns with a flame, but as soon as the platinum spiral glows and the metal holder of the wick is sufficiently warm, the flame will either expire, or, if this be delayed too long, may be extinguished by rapidly popping the glass cover on and off again, when the platinum spiral will remain in a glow until all the spirit in the lamp has evaporated, for platinum has the remarkable faculty of continuing to glow in warm spirit-vapour.

The practical effect of this is, that as the air immediately surrounding the spiral becomes heated it rises, and is replaced by air drawn in from all sides under the glowing spiral, through which it is compelled to pass, causing all combustible matter contained in the air to be consumed. If half a dozen smokers were to endeavour to fill with tobacco smoke an ordinary-sized room in which such a lamp is burning, they would not succeed. The fumes would be constantly drawn through

the lamp and consumed. The same thing happens to all odorous matters in the atmosphere of the room. If the platinum lamp be lighted in a room after dinner, however strongly the atmosphere may have been charged with odours, in a few minutes all trace of them will have vanished.

This effect of the lamp in purifying the air was already known to others, and was, therefore, not discovered by me. What I did discover is, that if a small quantity of ozogen be mixed with the spirit, this is not at once consumed, but continuously mingles with the atmosphere in very fine proportions. Its action is then twofold: it destroys all offensive smells in the atmosphere; and it is inhaled into the body, where it develops this deodorizing faculty in an extraordinary manner.

Quoting my own experience as a guide for others, I may state that I was formerly greatly troubled with my digestion. Under the Sanitary Woollen System the daily recurrence of flatulence and heartburn had ceased, but they were occasionally still felt, especially in winter, although in a much milder form. My suffering from wind in the intestines had not, however, undergone so radical a change; I was much less troubled, but still it made itself felt daily. In the last seven weeks, during which I have allowed the platinum lamp to burn in my study and sitting-room throughout each day, a very great alteration has taken place. Of flatulence and heartburn there has not been the least trace, while the trouble from wind has been reduced to a vanishing point.

The deodorizing influence of the platinum lamp has extended to the evacuations, which are much

less offensive, and have been delayed for several hours without any detrimental effect. This last circumstance is strong evidence of the correctness of my doctrine of the ordinary sensations—that they are all, without exception, produced by odorous matters. The necessity in question is locally felt, just as is the opposite sensation of hunger, but is actually due to the odorous emanations from the digested food having reached a certain concentration in the body. The subsequent relief is not merely mechanical, but is caused by the removal of these "noxious" emanations, with their depressing and disabling influence on the whole system. This concentration is retarded by the deodorizing effect of the ozogen dispersed by the platinum lamp. It is a common experience that in travelling, and generally with change of air, the necessity above referred to is absent, even for days; the reason being that the impulse given by the unaccustomed air to the exhalation of the skin prevents the required concentration of odorous matter.

If we consider the great influence on the health of the gases which accumulate in the intestines, and which must be abnormal, inasmuch as healthy wild animals are free from them, the experience described above is highly significant.

The lamp, however, has one objection, which should not be too lightly estimated. When I commenced to burn it I was warned that minute quantities of platinum would evaporate, and induce headache. This result at length made itself felt after the lamp had been burning for several weeks, and its use had to be discontinued for some days, until the headache disappeared. This places a

restriction on the use of the lamp. Some persons will not be able to endure it for long, while those who are less sensitive should only employ it when ordinary means of ventilation are not forthcoming, and even then not for too lengthy a period, extinguishing the lamp directly the head is in any way affected.

While I was quite unprepared to find that the platinum lamp would accomplish all that I have described, I was also struck with what it failed to accomplish. I had hoped that its effect on the atmosphere of the rooms would have removed the disturbance in my throat, but such was not the case. The complaint certainly assumed so mild a form that I was able, on the occasion of a lecture which I gave at Basel, to speak for twenty-eight out of the sixty hours which I was altogether absent from home, twenty-four hours being spent on the railway, and five in sleep; yet my throat was rather better than worse afterwards, but became more hoarse a week later, when I lectured and spoke for a period of seven hours. It improved, however, directly the barometer fell, and there was more stir in the outside atmosphere, to the stagnation in which the affection in the throat was due, and not to the air in the rooms, which had been purified and deodorized by the platinum lamp and ozogen.

I recommend the use of the lamp in badly ventilated rooms, such as workrooms, offices, schoolrooms, and in cases, where, out of consideration for others, the ventilation is insufficient. Persons who believe that they cannot sleep with the window open, whether on account of cold, or of chronic

illness, or because of the vicinity of some evil-smelling locality, should deodorize the atmosphere of their rooms with this lamp, bearing in mind that when it is allowed to burn too long in a room of moderate dimensions it may induce headache. Lastly, all sufferers from the disorders which I have indicated as arising during the period of digestion will find great relief by burning the lamp.

Directions for use of the Platinum Lamp.

The spirits of wine must have a strength of 96° "Tralles," or the platinum spiral will not glow, and must be perfectly free from fusel oil, which is otherwise diffused in the atmosphere of the room. Many disappointments have been caused by using too weak spirit.

Before lighting a wick for the first time, both wick and spiral should be well sprinkled with spirit, and the circular rim of the metal wick holder should be filled. The flame should burn three or four minutes, or half that time for a wick already in use, in order to draw up sufficient spirit into the wick to keep the platinum glowing. When the flame has burned sufficiently long, the glass cover should be popped quickly on and off again, extinguishing the flame, when the platinum spiral will continue to glow until the supply of spirit is consumed.

Great care should be taken that the wick does not touch the spiral at any point. The formation of the latter must not be too close, or ash and dirt (taken from the air) will accumulate, preventing the passage of air. When the platinum is glowing,

the distances between the spirals may easily be adjusted, if necessary, with the help of a needle.

By pushing the wick up or down, more or less of the spirals can be made to glow, but three or four are sufficient.

The lamp should be protected from draught, but if a light current of air causes the flame to revive, the spirals are too far apart, and should be gently compressed downwards.

To extinguish the glow, the glass cover is placed over it, and should be left until the lamp is again required, as otherwise the spirit will evaporate.

The lamp should not be allowed to continue to glow until all the spirit is consumed, or the wick will char. If this happens, the charred portion must be removed, and the wick tied round with thin thread, and trimmed with scissors, so that it may be isolated from the platinum.

A few drops of Eau de Cologne or other perfume added to the spirit will be continuously imparted to the atmosphere. The important deodorizing effect of mixing ozogen with the spirit has already been explained. The usual proportion of ozogen to one filling of the lamp is 15 to 20 drops, but varies according to the size of the room and the number of persons in it. For very large rooms and theatres, two or more lamps are necessary.

If the spiral is so dirty as to interfere with its glowing, it may be removed, carefully rolled into a coil, and polished bright; it should then be re-twisted on the glass tube furnished for the purpose into a spiral shape, and applied once or twice round the bottom end of the wick-holder, to which it will then cling.

WRITERS' CRAMP.

(1882.)

A FRIEND, who is over 60 years of age, and who has not yet adopted the Sanitary Woollen System in its entirety, writes to me:—"Your account of the effect on your throat of the smell of the paper from which you were reading aloud, set me thinking, as I write daily for several hours, and have always much occupied myself with paper. You may perhaps remember that I have complained to you respecting cold in the hands, especially in the fingers. Particularly when writing, even in a warm room, the cold seemed to penetrate to the bone. My attention having been aroused by your remarks respecting paper, I laid a piece of woollen cloth on my writing paper, so that the latter no longer came into direct contact with the fingers. I immediately experienced a remarkable improvement, and now, after trying this device for several weeks, I am completely freed from the inconvenience referred to."

This communication led me to suggest that the exceedingly troublesome complaint of writers' cramp, by which many have been deprived of the means of earning their living, and with which medical science has hitherto found it so difficult to deal, is due to the influence of the vegetable fibre of paper, and may be cured by the use of a strip of woollen material under the hand. The accuracy of this conjecture has been strikingly confirmed by the well-known scholar and author, Fr. v. Hellwald, who informs me that he has acted on my suggestion, and has since been entirely free from writers' cramp. Others have written me to a similar effect.

THE SANITARY EFFECTS OF COLOURS OR DYES.—I.

(1882.)

THE difficulties which surround the investigation of this subject, whether from a scientific or a practical point of view, are considerable. In the first place, many different chemical substances and combinations of substances have to be taken into account; secondly, the matter is complicated by the inability to ascertain with what dye a material has been treated; for, in the division of labour involved in the production, the material may have passed through several hands after it has left the dyer, who, moreover, often regards his method of procedure as a business secret. Notwithstanding these obstacles, I have arrived at a point where I can lay down certain principles, accompanied by the needful explanation; and I can do this the more easily because there is a remarkable analogy between these principles and those on which the Sanitary Woollen System is based. Although in the essay on "The Nature of Disease" I have already stated the following fundamental truths, they cannot be too deeply inculcated, and I therefore recapitulate them.

If a strongly concentrated odour be inhaled, or a strongly concentrated fluid be swallowed, the smell or taste is repulsive; the rapidity of the voluntary movements, as measured by the stop-watch (see page 7), is retarded; the limbs feel heavy, as if fatigued; the breathing is more difficult, particularly

when an odour is inhaled; the flesh becomes soft; the body is distended; the heart beats more quickly and less regularly; the mood is depressed. In other words, such concentrated matters induce feelings of weariness, weakness, languor, and depression; and if the degree of concentration be intensified to a certain point, death will result.

Rarefied or diluted matters have a pleasant smell or taste, and are appropriately termed "fine." The rapidity of the voluntary movements when measured, as before stated, is enhanced; there is a sense of lightness and vigour in the limbs; the breathing is easy; the heart beats strongly but slowly; the mood is cheerful; in short, they have a cheerful, fresh, vigorous, and wholesome effect. Rarefied or diluted matters are therefore conducive to health and life, while concentrated matters engender illness and are poisonous.

On these fundamental facts are based the following principles respecting the sanitary importance of colours:—It is well-known that dark are less healthy than light colours. Colouring matter in a concentrated condition is dark, and, in a rarefied condition, light. When evaporation from colouring matter is inhaled, the odour from the dark colour is concentrated, and from the light colour is rarefied. The distinction is especially noticeable in summer, because, in the sun, dark colours absorb more heat, and therefore evaporate more freely than light colours. This explains why darkly dyed clothing is particularly disagreeable in summer, rendering the atmosphere hot, oppressive, and exhausting.

It is clear from the foregoing that the greater or less readiness with which a colouring matter

evaporates . constitutes an important difference. From this two deductions may be made.

1. Natural colours are preferable to artificial. Whenever natural colouring matter is present in hair or wool it is not situated on the surface ; either the inner pith of the hair is coloured, or, when the outer stratum of the hair, which consists of numerous very minute spindle-shaped cells, is coloured, the colouring matter is found in the centre of each cell, while the rind of the cell is colourless. This may be verified by examining through the microscope black horsehair resolved by sulphuric acid into separate cells. With dyed hair the colouring matter is at best equally distributed in the hair, and will clearly evaporate more easily than natural colouring matter, as it lies partly on the surface, while the latter is completely enclosed.

2. "Fast" dyes—*i.e.*, those which do not fade—are more wholesome than dyes which fade readily. The fading is generally, although not always, caused by evaporation. A dye which fades rapidly, therefore, gives off a concentrated vapour, and is thus injurious. A dye which fades or evaporates little gives off a rarefied vapour, and is therefore wholesome. Whether a colour will fade quickly or slowly will partly depend upon the volatility of the colouring matter, as also on whether the latter simply rests upon the fibre or saturates it. The foregoing explains the important difference between indigo-black and other black dyes ; the former, as a much "faster" dye, is considerably less injurious than the rapidly fading logwood dyes. Among the lighter colouring matters, cochineal is notoriously the "fastest," and accordingly it is wholesome.

Of the foregoing propositions the leading one is sustained by the following circumstance. Colouring matters not only affect the health directly through their own nature, but also by their relation to the exhalations of the body. Such colouring matters as attract the "noxious" exhalations are inferior to those which attract the "salutary" exhalations.

The precise quantity of odorous matter which a solid body (in this case a colouring matter) attracts, depends, when other conditions are equal, on its own bulk; in other words, on the degree of its concentration: a concentrated—*i.e.*, dark—colouring matter attracts more odorous matter (because it represents a greater bulk) than will the same colouring matter when rarefied—*i.e.*, in a lighter shade. Another firmly established fact is, that all matter, when concentrated to a certain point, becomes injurious, some reaching this point sooner, and some later. The difference between the "salutary" and "noxious" matters of the exhalations of the body is merely that the former require a higher, and the latter a lower, degree of concentration to become injurious. Hence it follows that whether a colouring matter attracts in preference the "salutary" or the "noxious" matters, it will be more wholesome in accordance with the smallness of the quantity of odour which it takes up; and this again depends upon its own degree of concentration—that is to say, upon its being employed to produce a light or a dark dye. Thus light colours are directly and indirectly more wholesome than dark colours.

I am certain that readers who have been in the habit of observing for themselves and of reflecting

on this subject will be able to supply confirmation of what I have stated. For instance, black clothes are less comfortable than light-coloured clothes, and have a more disagreeable odour.

The effect on the nerves of various coloured clothing was strikingly confirmed by numerous nerve-measurements, which I made on several days in succession between 8 and 9 a.m. I wore the same underclothing in each case.

In a brown suit the average interval of time, on ten occasions, required for the finger to stop the watch was $\frac{80}{1000}$ parts of a second; in an almost black indigo-dyed suit the average on eight occasions was $\frac{100}{1000}$; in a logwood-dyed black suit the average on twenty occasions was $\frac{144}{1000}$. Thus the indigo suit was 25 per cent., and the logwood suit 80 per cent., worse than the brown, indigo being, however, 55 per cent. better than logwood. Further observations which I made as to the effect of colours on the powers of physical endurance, confirmed the foregoing. I tested my running powers in three different suits of clothing, and found that in the brown suit, which I tried ten times, the minimum distance was 800 metres and the maximum 2,400 metres. On the three occasions on which I tested the indigo suit I could proceed no further than 800 metres, and in the logwood suit I was completely exhausted at 500 metres. These experiments were not repeated sufficiently often to allow of precise comparison; but they so completely harmonised with the results of the nerve-measurements that they will assist my readers to understand why I attach so much importance to the colour of the clothing.

THE SANITARY EFFECTS OF COLOURS OR DYES.—II.

(1882.)

TO the proper understanding of this subject, it is necessary to bear constantly in mind that each person has an individual constitution, and that consequently all people are not affected alike by one and the same substance or matter.

This may be illustrated by the well-known difference of taste which prevails respecting even those foods which would be expected to please and suit everybody, as, for instance, milk. Many thoroughly healthy people cannot endure milk ; in nearly every large household will be found at least one person who not only dislikes milk, but whom it affects with stomach-ache and diarrhœa. Others, again, who are fond of cow's milk have an insuperable aversion to the milk of goats or asses.

This like or dislike for certain foods is apt to take an extreme form—that is to say, one class of people will be exceedingly fond of them, while the other will be equally averse to them ; I refer to mutton, onions, garlic, cheese, cray-fish, strawberries, etc. The two latter delicacies have the reputation of producing, in certain constitutions, eruptions of the skin, inflammation of the throat, and similar disorders. I myself suffer from inflammation of the throat if I eat strawberries ; and this idiosyncrasy began with the setting-in of puberty, and therefore with a so-called change in the constitution.

The differences in constitutions are also the

stumbling-block in the medical treatment of sick persons: a medicine which has done good service in ten cases may possibly in the eleventh not only fail, but do positive harm, and doubtless many persons have been thus unconsciously poisoned by the medicines administered to them. This consideration has brought treatment with medicines, especially in big, so-called allopathic doses, into such discredit, not only with the public, but also with the medical profession itself, that the modern allopaths are very reluctant to prescribe medicines. The ill-effects of large doses have given rise to homœopathy, or the system of minute doses, whereby the danger of causing injury through a wrong remedy is greatly diminished. But the diversities of constitution, which again constantly vary, even in one and the same person, according to the disposition, *genius epidemicus*, etc., also form the main difficulty in homœopathy, which fails to cure if the remedy applied be "individually" wrong.

Returning to the question of colours, the diversity of taste in the choice of the colours of clothing is sufficient to show that not every colour affects all persons alike. Certainly, inasmuch as science ignores in what instinct and feeling really consist, the eye alone is assumed to be responsible for the diversity of taste in the matter of colours. This assumption, however, is shown to be incorrect by the actual discomfort, or, at least, diminution in comfort, which most people feel in black clothing; further, may be cited the cases which arise from time to time, especially since the introduction of aniline dyes, of severe poisonous effects produced by the dyes of articles of clothing.

That I am able to throw new light on this subject is partly due to my discovery in the "neural-analysis" * of a method of testing the noxious or salutary quality of any given object, by accurately measuring the effect of the inhalation of its odour in retarding or accelerating the rapidity of the nervous action; but I have also derived information on the subject from experiences which have been gathered in connection with the Sanitary Woollen System.

When a white linen shirt is worn between the almost universally dyed outerclothing and the body, the action of the dye on the health cannot be so powerful as when the underclothing is dyed, which is very commonly the case with woollen shirts and vests. Moreover, the Sanitary Woollen System causes the skin to develop much greater activity, and therefore to be much warmer than in the case of a wearer of linen; and it is the warmth of the skin which brings into action the dye of the woollen shirt. I will here mention two cases which have come under my observation respecting dyes hitherto considered harmless—logwood and cochineal.

A lady writes to me that on October 16 she put on a grey "combination" garment before going to bed, and awoke after an interval of one hour with strong feverish symptoms, and with such pains, especially in the region of the stomach, that she thought she must have unwittingly taken poison. This condition lasted until the morning of October 18, when it occurred to my correspondent that the cause might lie in the garment, which she accordingly changed, when the relief was intense,

* See page 7.

and the fever and the pains subsided. I found that the garment, which was forwarded to me for examination, was dyed with logwood ; and on applying the "neural-analysis" test, I found that its effect on the nervous action was a retardation of 34 per cent.

The first insight into this subject which I obtained from personal observation was when I lately had occasion to wear mourning. Under my black clothes I wore a cochineal-dyed shirt. About this time an Italian physician had remarked to me that the Savoyards wear almost exclusively wool (as, indeed, is the common practice throughout Italy), but that they suffer much from ischias (pain in the hips). Not long afterwards, I felt occasional drawing and burning pains in the neighbourhood of the hips and loins, and I was reminded of the foregoing remark, which I admit caused me considerable alarm. I found, however, as I went on, that at night I was free from the pain, which made itself most felt in a sitting posture, when the trousers were drawn tighter, causing a sensation of numbness or loss of feeling over the entire region, and of uncomfortable heat. A rapid walk on a warm spring day solved the problem over which I had for some time puzzled in vain. The exercise induced perspiration, and this was followed by a sensation as though I had a mustard plaster applied to the region of the hips and loins. It then first occurred to me that the black trousers might be the cause of the annoyance, which, indeed, rapidly subsided on my changing the trousers for a brown pair. In this case the "neural-analysis" of the cause of offence retarded the nervous action 75 per cent.

In another instance, a friend reported to me that a numbness or loss of feeling in the skin of the chest had caused him serious alarm, until he found that feeling was restored on his ceasing to wear the grey woollen shirt, which, like my black trousers, had been dyed with logwood.

An interesting commentary on the effect of logwood was supplied to me by a hat manufacturer, to whom I related the foregoing incidents, and who remarked that the effect of logwood in depriving the skin of the sense of feeling was well known in the trade. As a practical illustration he pressed the burning end of his cigar in the hollow of his hand until the odour of scorching skin was perceptible, without any sign of pain.

As regards the effect of cochineal on certain constitutions, I have heard of several cases in which the wearers of shirts thus dyed have suffered from rheumatic and other pains, which have disappeared on the shirts ceasing to be worn. Cochineal dye may be compared, from a sanitary point of view, with cray-fish or strawberries ; to some constitutions it is agreeable, while on others its effect is poisonous. The proverb says, "What is one man's meat is another man's poison."

THE SANITARY EFFECTS OF COLOURS OR DYES.—III.

(1883.)

AMONG the researches into the effects of colouring matters on the health a leading place must be accorded to those instituted by the homœopathic

body, whose inquiries, however, have not been directed to the action set up by the dyes in clothing, but by colours taken internally in the form of medicines. For the instruction of those of my readers who are unacquainted with the homœopathic doctrine, I append the following information.

Every substance, when swallowed in sufficient quantity, engenders phenomena of illness, or, in fact, of poisoning, which are peculiar to each special substance, and consist of a certain combination of symptoms.

Homœopathy teaches that, if a disease be based on a complication of symptoms similar to those which are induced by swallowing a large dose of a medicinal substance, a homœopathic dilution of the latter is the proper remedy. It is necessary to the comprehension of this question, that regard should be paid to what I have previously written on the subject, especially where I have pointed out (on page 127) that the action on the body of any substance which is swallowed or inhaled is of two entirely opposite natures: in a large, or poisonous quantity, it disables, and causes illness; conversely, in small, so-called homœopathic doses, it animates, arouses, and has a healing influence.

In treating of the action of dyes in the clothing, the foregoing consideration is of the highest importance; if the dye is fixed so fast in the clothing that, even when the body is heated, only minute—*i.e.*, homœopathic—quantities mingle with the atmosphere of the clothes, and thence with the atmosphere which is breathed, their effect is, as a rule, that of the homœopathic dose, and is then favourable, provided that there be no special indi-

vidual antipathy (or so-called idiosyncrasy) to the substance in question. If, however, the dye adheres loosely, or is "spurious"—*i.e.*, readily fades; or if, when the dye is genuine and "fast," there is, in consequence of insufficient rinsing after the dyeing process, a surplus of loose colouring matter (perceptible by its rubbing off), the poisonous deleterious effect will be apparent.

A further consideration is, that the evaporation of dye from the clothes is largely dependent on the temperature and humidity of the atmosphere, being less under conditions of cold and dryness, and greater under those of warmth and moisture. Thus the effect of a dyed garment in winter, or in dry weather, or when the body is in repose and the skin is cool, may be neutral, or even agreeable; while in summer, in hot rooms, or when the body is heated, deleterious effects (discomfort, languor, local pains, etc.) may be felt, especially when to these conditions are added a damp atmosphere and perspiration.

The principles of my system of colouring matters are the necessary deductions from the foregoing considerations, and I will here shortly recapitulate them:—

1. For summer clothing, working, and every-day costume, especially for any kind of athletic sport, as also in hot climates, the material should be entirely free from dye—*i.e.*, natural white or natural brown.

2. Dyed materials are least injurious in winter, in cold climates, when the body is in repose, and for Sunday, visiting, and holiday attire (but not for dancing exercise, which is a species of athletic sport).

3. Wholly to be condemned are all dyes which readily fade. The assertion that aniline dyes are only injurious when they contain arsenic is quite false; they are chiefly noxious because of their volatility.

4. "Fast"—*i.e.*, non-volatile—dyes are admissible, but only when no residue or surplus of loose, unrinsed dye is left in the garment; this is easily tested, as in such case the colour comes off. As the process of rinsing can only be complete when the wool is dyed before being worked up, all fabrics which have been dyed in the piece, or printed with dyes, should be rejected.

5. The less colouring matter that a garment contains—*i.e.*, the lighter it is dyed—the smaller will be the danger arising from the colouring matter.

In carrying out a system of sanitarily coloured clothing, it would be impracticable to discard all artificial dyes, and I have therefore adopted certain dyes, especially indigo and cochineal. Indigo, cochineal, and logwood are each capable of engendering the phenomena of poisoning; but in practice there is this difference, that indigo and cochineal, as "fast" dyes, never evaporate from the clothing in such quantity as (idiosyncrasy excepted) to produce injurious effects. The converse, however, holds good of the "spurious" logwood dye, which, moreover, has the faculty of attracting the "noxious" exhalations of the body.

GIRDED LOINS.

(1882.)

A CORRESPONDENT who has adopted the Sanitary Woollen System writes :—"I cannot become reconciled to wearing a belt, notwithstanding that this was generally practised in the Middle Ages, and is still customary with the military, and among the inhabitants of southern countries (although nothing similar obtains among any of the four-footed creation). To wear a belt seems contrary to nature, as it checks the processes of breathing and digesting, especially of the former, in the case of the male sex, whose respiration brings the abdominal region more into play, while the female sex breathe chiefly in the region of the chest. The man's breathing-muscles are attached to the cervical vertebra, the collar-bone and shoulders, and the ribs, which latter they extend and widen. So that, if a belt be worn, only the upper part of the chest is capable of the proper undulatory motion incidental to respiration."

In reply to this I have to say that my experience of wearing a belt has been acquired at different periods of my life. As seminarist and student—a period during which my health was good—I regularly wore an ordinary gymnastic belt, and found that it suited me very well, with the exception that if I took off the belt when I was perspiring I easily caught cold in the part which the belt had covered. This induced pains in the direction of the navel, such as are caused by cramp or colic, without, however, affecting the bowels, and could be very troublesome

for two or three days. I consider this to have been an affection of the peritoneum, caused by enervation of the skin of the abdomen, for, of course, at that time I was not clothed in wool.

In the second period of my life—from 27 to 46 years—during which I suffered with my digestion as I have elsewhere described, I wore no belt, and could not bear to have anything tight round the loins, because the circumference of the abdomen continually varied ; and, after meals, when my dyspeptic troubles commenced, I was obliged to loosen the trousers, although these were made to fit very easily. The pain in the direction of the navel, described above, frequently made itself felt, especially in summer.

About the time that I inaugurated the Sanitary Woollen System, I was reading the well-known *gourmand* BRILLAT-SAVARIN, who writes amusingly and even instructively, but whose book has as little claim to the title of *The Physiology of the Sense of Taste* as a cook would have to that of "physiologist." I was much struck, however, by the remark, that in cases of tendency to corpulence the wearing of a belt was much to be recommended, not only in the daytime but also at night. I was aware that corpulence is injurious, and that the body, when constrained, possesses great capacity of self-help. Simultaneously, therefore, with adopting the Sanitary Woollen System, I began to wear an ordinary leather belt, about two inches wide, but only during the day. I found that I bore it very well, and as the Sanitary Woollen System caused my dyspepsia, and the puffed-out condition incidental thereto after meals, to disappear, I could maintain the belt equally tight

throughout the day without inconvenience. Certain other evils, however, made themselves noticed.

I *felt* that a LEATHER belt was wrong, especially when I perspired, and there gradually arose a disagreeable sensation in the skin wherever pressed by the belt. The test of nerve-measurement (see page 7) by inhalation of the odour of the belt after it had been some time in use explained this sensation, as the result was a diminution of 38 per cent. in the rapidity of the nervous action. I consequently tried a woollen belt of similar width, but it afforded too little resistance, and was soon useless, rolling up, and cutting like a rope. My hope that the body would accommodate itself to the pressure of the belt was not fulfilled as I desired ; the circumference under the belt continually lessened, so that I had to keep tightening the strain to prevent the trousers from slipping ; but above the belt, and to some extent below it, the protuberance was proportionately increased. It was thus clear that this form of woollen belt did little or nothing to hinder corpulence. In spite, however, of the inconvenience described, I considered that the belt had distinct advantages, as somehow I felt comfortable with it, and during this period, which lasted till within a year of the time of writing, I was free from the pain over the navel previously referred to.

My experiments entered on a new phase in the last excessively hot summer. I must premise that I formerly suffered considerably from difficulty of breathing, and from great corpulence (42⅔ inches round the body). The relief afforded by the Sanitary Woollen System has exceeded all my hopes and expectation, but still I am not completely satisfied.

The normal measurement round the body should be 75 per cent. of that round the chest. The latter in my case is 39⅜ inches, and the measurement round the body should therefore be 29½ inches, whereas it fluctuates between 31½ inches and 34 inches, according to my condition and the season of the year. It is thus still about 4 inches too large, and I know that in proportion as it is smaller or larger, I am more or less well.

The difficulty of breathing had also greatly improved, but I was unable to account for the circumstance that when I walked somewhat quickly up hill, I felt—especially in hot weather—a pain at the lower end of the breast-bone, shooting right and left. I had often puzzled over the origin of this pain, and had long accepted a mistaken theory that it arose from some old-standing distortion of lungs and chest which would accompany me through life, when light was at last thrown upon it in the following manner :—

I was panting up the southern slope of a valley at the hottest period (between 4 and 5 p.m.) of one of the hottest days of last summer, the path being entirely without shade, and the sun burning pitilessly down upon me, when I suddenly perceived that the pain arose exactly at the junction of the diaphragm with the anterior verge of the chest, and was the natural consequence of the vehement action of the diaphragm. On further observations of my movements in breathing I remarked that I breathed exclusively in the region of the diaphragm and lower ribs, and that the upper ribs remained almost completely inactive. I now remembered the well-known fact that difficulty in breathing (asthma—in

horses, broken-windedness) is caused by a wasting of the lungs which always commences in the tissues of the upper portions ; and I had long felt that this affection was due to insufficient use of the lungs. When I further considered that men are much more subject than women to asthma, I had a clear perception of the whole case, as follows :—

Two conditions of breathing must be distinguished: (1) Quiet breathing, when lying down, sitting, or walking slowly, is differently performed by men and by women ; at least, this is the case in our state of civilization, although I doubt whether it is so everywhere. Men breathe only in the region of the diaphragm, whereby merely the lower portions of the lungs alternately fill and empty, while the upper portions are inactive. Women, on the other hand—chiefly because the diaphragm is hampered by the corset or by the clothing being tied round the hips—breathe in the direction of the upper ribs, and therefore, with the tips of the lungs ; this is the cause that women are relatively attacked less frequently than men by asthma. (2) When the breathing is accelerated by strenuous motion of the body, the difference in this respect between ordinary men and women disappears, and the whole of the lungs is called into play.

It is thus clear, that when a man leads a sedentary life, and is seldom or never compelled by strenuous bodily movement to breathe with force, two things will happen : The inactive tips of the lungs will waste away, entailing subsequent difficulty of breathing, and he will become so accustomed to breathing solely in the region of the diaphragm as to lose all facility of breathing in the region of the upper ribs.

If an occasion then arise for more abundant respiration, the body will fall from habit into the error of endeavouring to supply this by increased activity of the diaphragm, instead of obtaining assistance from the direction of the upper ribs. The two-fold consequences are : (1) The result is inefficient, because only the lower lobes, instead of the entire lungs, are worked ; (2) The vehement movement of the diaphragm produces the pain which I have described.

In considering how this might be remedied, the circumstance that the climbing of ascents induces enhanced activity of breathing led me to think of people who inhabit mountainous districts, and before my mind's eye stood the German Tyrolese (whom I have long respected for their simple and healthy manner of living), with their belt of nearly two hands' width in front. I reasoned that the wearing of so broad a belt limits the possibility of breathing in the region of the diaphragm, and this, whenever the need for breath increases, compels recourse to the region of the upper ribs, thus preventing (1) the wasting away of the tips of the lungs through disuse ; (2) the habituation of the body to dispense with breathing in the region of the upper ribs ; (3) excessive and painful breathing in the region of the diaphragm.

I at once caused a belt, exactly as broad as that of the Tyrolese, to be made of strong woollen material ; and the result surpassed my expectations. The effort of breathing when climbing ascents, was greatly lightened, and I was at once entirely freed from the pain in the diaphragm.

What, of course, could not at once be remedied was the wasting away which had, undoubtedly,

affected the tips of my lungs. How far this, in the case of a man in his fifty-first year, can be overcome I am unable to judge; and I do not suppose that, especially with my sedentary mode of life, I shall ever become an active mountaineer. But the fact remains that I have occasion weekly to ascend a hill $1\frac{1}{4}$ miles long, and 705 feet high. I do this without effort in twenty-five minutes, and, if I exert myself, in twenty minutes. When I also consider that I can trot $1\frac{1}{2}$ miles on a slight descent, I feel that, as an asthmatic subject of many years standing, I have reason to be satisfied; and I ascribe these results in the first order, to the Sanitary Woollen System, and in the second to the Tyrolese belt.

The belt must be 6 inches broad in front, narrowing on either side towards the hips. The chief difficulty of constructing such a belt of woollen material was the tendency of the broad band to fold together, and thus to fail of its purpose. This has been overcome by inserting pieces of whalebone or steel, and I can now strongly recommend this broad belt to be worn, especially by those who suffer from corpulence and difficulty of breathing.

THE CORSET.

(1882.)

IN connection with the preceding essay on the value of girding the loins, I will make a few remarks on the subject of ladies' corsets. If the views of the leading authorities on health-culture are correct, there is nothing more prejudicial to the health than the corset. Indeed, their attack on the

corset comprises pretty well all that they have to say respecting ladies' clothing, and it is usually enforced by dreadful representations and models of the distortion of the liver which is caused by tight lacing. This may be true, but it is not the whole truth.

The fault does not consist in the wearing of a corset, but in the material of which it is made. This is usually substantial (possibly even pasted) linen cloth, and (1) concentrates, in an intensified degree, the disadvantages of clothing made from vegetable fibre ; (2) is, as a rule, laced too tightly, because the great enervation of the body which ensues induces a feeling of want of support and a tendency to unshapely increase of bulk, only to be restrained by the use of force, under which the internal organs suffer.

Ladies, however, who have adopted, and especially those who have grown up under, the Sanitary Woollen System, and who wear the Sanitary Woollen corset, need to use no force in order to preserve the shape ; their compact firm figures will not require support. They do not therefore, lace too tightly, and in the Sanitary Woollen corset they have all the advantages of girded loins without the disadvantages.

It is with the corset as with the shoe. Hygienic science has hitherto treated the evil as one of mechanical conditions and of space, while it is really due to the use of unsanitary material.

THE SANITARY BOOT.

(1882.)

A SANITARY construction of boot requires that, as far as possible, all impediment to evaporation should be removed, and that perspiration should be prevented from accumulating. The unpleasant odour which stockings or socks acquire in the ordinary boots should thus be avoided, and the foot should remain comfortable, warm, and dry. To design a boot capable of satisfying these requirements presented a problem full of difficulties, which, however, were mainly overcome by acting on the principles propounded in the Sanitary Woollen System, in the substitution, as far as is practicable, of woollen material for leather, which is nearly impervious to evaporation. The difference between the Sanitary Woollen and the ordinary leather boot is equal to that between the Sanitary and ordinary coats, as will be found on recurring to the use of the latter kind of boot after wearing the other for some time.

The best form of boot on sanitary grounds is one made, with the exception of the sole, entirely of woollen cloth, without any addition of leather. Another form, more calculated for muddy and very rough walking, has a narrow leather border all round, and a narrow piece of leather over the toes. This last should not reach back beyond the front part of the toes. The perspiration is most abundant between the toes, and at the angles of junction it is most injurious. The hinder extremities of the

division between the toes, therefore, especially need ventilation.

The penetration of water from without can do no harm when the feet are thus clad. On a fortnight's pedestrian tour our party of eight persons had thoroughly wet Sanitary Woollen boots for hours at a time, and we felt no inconvenience nor discomfort, nor was there the least injury to the health of any one in consequence. In fact, if, after a long walk, the feet are swollen and fatigued, by stepping into water the sense of discomfort is quickly dispelled, and the vigour of the feet is renewed. The socks and interior woollen soles, which prolonged walking renders hard and stiff, become elastic again with the water, and feel like velvet to the tread.

The capacity of endurance of the feet is much enhanced by encasing them in woollen instead of in the ordinary leather material. Of the eight members of the pedestrian party already referred to, not one became in the least footsore, although we frequently walked upwards of twenty miles a day during the fortnight. In another case, an acquaintance walked for fifteen hours in Sanitary Woollen boots without blistering the feet.

As the boots should fit quite closely at the ankle, and "side-springs" are objectionable, by causing perspiration and impeding evaporation, the "lace-up" form is chosen, reaching to the calf of the leg. With a little practice lacing up soon becomes easy to those who are not already accustomed to it, and it is the only correct principle for making the boot fit closely.

Another material for boots which possesses great

sanitary advantages is leather made from undyed buckskin. I have tried this now for some time, both in dry and wet weather, and can state that in point of durability it considerably surpasses ordinary shoe leather. Buckskin leather is by no means impervious to water, but the feet remain, even when the boots are wet, not only as warm as in wet woollen boots, but distinctly warmer, probably because the cloth of the latter has hitherto been dyed. This is so much the case that it is positively pleasant to put on the buckskin leather boots when they have been freshly washed, and are still wet. I can therefore recommend buckskin leather for the feet nearly as strongly as woollen material, especially for ladies' ball-toilette. The ladies of my family are greatly pleased with their buckskin leather dancing-shoes, and, indeed, a few decades since, such shoes were the fashion.

Another important point is that the impregnation of tanned leather with a proper composition of mineral grease prevents it from being tainted by the perspiration of the feet, and renders it soft, pliable, and perfectly water-tight. This last is a doubtful advantage: but I have arrived at the conclusion, after for some time wearing high boots made of leather thus impregnated, but lined with undyed woollen material, that the objection is less weighty than I had previously supposed. At all events, if water-boots are required, those impregnated with mineral grease, which will not became rancid, are far preferable to such as are treated with animal grease, which does become rancid.

An important question in connection with this subject is the material that should be used for blacking the leather. By mixing indigo with mineral

grease a blacking is obtained which gives the leather an excellent appearance, while not injuring its sanitary qualities. The dust, however, is more apt to cling to the leather than when ordinary polish is used ; but this objection is minimized by the consideration that in dusty weather Sanitary Woollen boots without a bordering of leather should be used ; the leather border is only for dirty weather. Moreover, if the boot, about ten minutes after the blacking has been rubbed into the leather, is brushed up, the tendency of the dust to cling is lessened, and the general effect is excellent.

As regards the sole of the Sanitary boot, the inner surface must be of leather, to give the requisite consistency. This, therefore, together with the leather stiffening at the back of the boot, which preserves its shape, is impregnated with mineral grease, to prevent taint from perspiration. Further, holes can be drilled through both these portions of the boot, and between the leather surface at the bottom of the boot and the outside sole a layer of felt inserted, into which the perspiration from the sole of the foot passes through the drilled holes. An outlet from the layer of felt to the open air is provided in the heel of the boot. The loose woollen sole, which can be changed and washed when there is much perspiration from the feet, presses into the apertures drilled through the leather surface at the bottom of the boot, and thus obtains more hold.

THE CLEANSING OF THE OUTER CLOTHING AND BEDDING.

(1882).

IT is not claimed that the Sanitary Woollen System reform has reached, or will reach, a stage of absolute perfection ; the object kept steadily in view is to replace what is bad by "good," what is good by "better," and what is better by "better still." This is apparent when the subject of the above heading comes to be considered. The endeavour to provide clothing and bedding which will not retain the "noxious" portion of the body's exhalations cannot entirely succeed, however nearly it may do so.

The linen or cotton shirt becomes unwholesome in two or three days, or, after copious perspiration, in as many hours, and the feeling of discomfort and aversion which it sets up in the skin tells the wearer that the shirt must be washed. It must not be supposed, however, that, apart from other considerations, the Sanitary Woollen shirt could be worn unwashed *ad infinitum* without a similar sense of discomfort setting in ; this must come at last, although the period which would elapse before it would be felt is considerably longer than with a linen or cotton shirt.

As regards the outer clothing, whoever, like myself, has worn such of linen or cotton, knows that after a few days it requires washing. Ordinary woollen outer clothing is made externally of wool, and internally is lined with vegetable fibre. The outer

woollen surface is much less liable than vegetable fibre to attract dirt ; and as most people are chiefly concerned for their exterior, they seldom or never cause the outer clothing to be cleansed, not considering that a regular Augean stable of offensive odours collects in the linen and cotton linings, endangering the health.

This condition of things has been improved by the Sanitary Woollen System, which discards the offensive vegetable fibre. But, even so, perfection has not been attained, and there comes a time when the degree of concentration of the accumulated odour of the body's exhalations in the Sanitary Woollen outer clothing necessitates that this should undergo a cleansing process. I refer the reader to my remarks on the concentration of odour in the essay on "The Nature of Disease" (page 130). The only difference between outer and underclothing in this respect is that the latter requires cleansing sooner than the former.

The relation which this question bears to that of the effect of colours on health, which I discuss elsewhere, is simple. The colour of the outer clothing is not the sole, but an essential, factor as to how soon the necessity for the cleansing process will arrive ; and my investigations leave no room for doubt that, from a hygienic point of view, the necessity is greatest with black colour or dye, and least with wool which is completely free from dye. As natural wool is white and brown, and white wool *appears* sooner to require cleansing, the highest rank must be awarded to natural brown wool.

The practical question for present consideration

is, when and how should the outer clothing and bedding be cleansed?

As to when; I answer, so soon as there is reason not to feel completely satisfied respecting the health and general condition, whether the complaint be termed headache, toothache, heartburn, rheumatism, catarrh, sleeplessness, disinclination to work, etc. As to how; if the clothing or bedding be dirty, it should be washed. If, however, it is free from apparent dirt, deodorization with ozogen (or effectually and more cheaply with camphor) will suffice. The process is the simplest conceivable. The bedding can be placed in the morning in a chest in which camphor has been deposited, or ozogen has been sprinkled. Two hours before bedtime the bedding should be taken out, to allow the smell of camphor or ozogen to evaporate, and the process is finished. The clothing may be placed in a receptacle overnight with camphor, and in the morning it will have heen cleansed.

THE TREATMENT OF INFANTS.

(1882.)

THE subject of bathing in connection with the Sanitary Woollen System, which is treated of in the essay headed "Cold Baths" (see page 121), has been raised in another form by a lady who addresses me from Helsingfors (Finland), with reference to her eight-months-old child, whom she has brought up under the Sanitary Woollen system since its third month. I will enumerate my cor-

respondent's inquiries, and append my replies in a similar sequence.

1. May the child, when in health, be bathed more than once a week?

2. Must the child be wrapped after the bath in damp, warm woollen clothes? how long should it be kept in them, and what is the effect? *Should the child be first well dried before the clothes are applied?*

3. The child's sleep appears frequently to be disturbed by dreams, so that it groans (as after a fit of crying), or laughs aloud. Is there any remedy for this?

4. I am told that the child will be enervated by the woollen clothing, and not sufficiently hardened against catching cold. There have certainly, from time to time, been attacks of cough and cold, but these have always been light, and have quickly passed away.

ANSWERS.

1. In health-culture there should be no rule of thumb. Everything should be decided by the consideration of what is necessary. A child should be bathed when it really requires a general cleansing, and in summer when it suffers from the heat.

2. With infants, as with adults, it usually suffices to place the dry woollen cloths, or clothing, over the dripping wet body. Only when the air is hot and dry should the woollen cloths, or underclothing, be directly wetted. It is simply a question of reproducing as exactly as possible the conditions under which the mammiferous animals bathe. Their coats take up little water because

they are not felted, as are, unfortunately, the materials of our clothing, and the hair is strongly permeated with fatty matter. A dog, on leaving the water, shakes itself, and in the course of half an hour to an hour is dry. Dogs can therefore bathe at any season, but in the cold of winter require a sufficient amount of violent exercise to dry the coat in proper time, the remaining wet too long being also unhealthy for animals. Man should be guided by these considerations, and manage so that, after bathing, there shall be as much water in the underclothing as will dry in the course of half an hour to an hour, not more and not less. Practice soon makes this easy. In Finland, where the climate is affected by the propinquity of the sea, the placing of the dry shirt and outer clothing on the dripping wet body, will, probably, at all seasons be sufficient; while in Vienna, Pesth, or in the interior of Russia, where the air is hot and dry, the clothing should be directly wetted, in order to secure the full enjoyment of the bath without detrimental consequences.

3. The child's sleep will cease to be restless when the health is no longer disturbed by excessive bathing on false principles.

4. If nothing worse has ailed a child from its third to its eighth month than light and evanescent attacks of cough and cold, notwithstanding the mistakes made in bathing it; and if, as is stated, the child's health is normal, what more can be desired? It should be remembered that 30 to 40 per cent. of children die in the first year, and that an equal percentage undergo severe illnesses.

Here may be inserted a communication received by Dr. G. Jaeger some months after the foregoing was first printed :—

"The writer, feeling convinced of the value of the Sanitary Woollen System, procured, in anticipation of the approaching birth of a child, an entire woollen outfit for the newly-born baby, which from its first existence has never worn a particle of linen. The appearance of the child, now six months old, is all that could be wished ; its limbs are agile and strong, the body is round, the flesh firm, and, in short, the child is as healthy as it can possibly be.

"As to the practical worth of the Sanitary Woollen System, the writer has noted down the opinions of the monthly nurse, a woman of twenty years' experience, as of more value than a great deal of theorizing one way or the other. At first the whole thing appeared to her ridiculous, and she used the various woollen articles with reluctance ; but after some time she expressed herself as follows :—

"'Although I am poor, and have brought up six children in linen, I would not hesitate to clothe the next in wool, for it gives only half the trouble of linen. The colds which babies so frequently catch are completely prevented by the equable and sustained warmth of the woollen clothing, which is of the greatest importance, as so little heat is generated in the body itself ; this particularly applies to the wet clothes which, when of linen, grow cold on the body, while the woollen ones remain warm. Another advantage is the time and labour saved in ironing. The washing of the clothes is simpler and quicker, and that of the frocks and shifts is not required so

often, as I am surprised how long they keep clean and free from smell. I also notice that daily bathing and soaping do a child more harm than good. This child was best when simply washed, without soap, each day, and afterwards lightly rubbed with a woollen rag, soaked in olive oil; it was only bathed once a week. I intend to recommend the bringing up of children in wool wherever I can.'

"To this may be added, that when the child was out of doors for some time the cloths which it wetted frequently dried on the way, a proof of the rapid evaporation; moreover, they *were free from odour*.

"In conclusion, the cost was about the same as of a linen outfit, having regard to the fact that only half the usual number of articles was necessary."

VEGETARIANISM.

(1882.)

THAT whatever is practically good and true finds its greatest enemy in doctrinism, over which, however, it invariably triumphs in the end, is an old story that recurs to me with especial vividness in connection with this subject. My first acquaintance with vegetarianism was in the form of the following doctrine:—

"According to the construction of his teeth, the nature of his digestive organs, and his systematic conformation, man belongs to the genus ape, especially to that of the so-called man-ape. As these animals are frugivora (fruit-eating), the fruits of the

earth must be the natural nourishment of man, for whom meat is unnatural food."

I have always opposed this doctrine on the ground of practical experience, which I will here briefly relate.

I was for nearly five years the technical and scientific director of a zoological garden, and I found that few animals presented so many difficulties in respect of frailty of health as the apes. When I entered on my duties I found that the apes were treated as frugivora—*i.e.*, were fed with fruit, onions, carrots, rice, potatoes, etc.; but milk was given to them as well. The result of this diet was, as is stated in the journal of the Frankfort Zoological Garden, an annual mortality of 50 per cent.! The chief, and indeed exclusive, cause of death was pulmonary consumption.

The following observation induced me to adopt another method:—I had two mandrils, which soon after their arrival showed every symptom of consumption (phthisis). As I was watching them one day, a mandril quickly gripped a mouse which came out of a hole into the cage, and devoured it with extraordinary eagerness.

I was reminded by this incident (1) of the successful experience which I had had in treating two tuberculous patients with the so-called "cold preparation" of Liebig's extract of meat (by no means to be confounded with the Liebig's extract ordinarily sold)—*i.e.*, a solution of meat in $\frac{1}{1000}$ of muriatic acid; (2) that the cravings of the sick are nature's hints, to which the physician should always attend.

From that time I treated all my apes as omnivora, or general eaters, and the result was remarkable. Of the mandrils one, indeed, died after a few weeks, full of tubercles, but the other recovered and survived for

over a year; an examination after its death showed that the tubercles had been arrested, and that the cause of death was heart disease. The main point, however, was that the total mortality of the apes was reduced from 50 per cent. to 20 per cent. On my recommendation, my colleagues in the other zoological gardens in Germany adopted the same system, with a similar result. To this may be added that apes in a wild state are by no means exclusively frugivora, but are eager and alert to consume all kinds of insects, worms, snails, birds' eggs, young birds, mice, etc.

I was therefore firmly convinced that the vegetarian doctrine is erroneous, and I was strengthened in this view by the fact that my chronic dyspepsia distinctly improved when I began to avoid potatoes and farinaceous and leguminous foods, from which I suffered most inconvenience, and to keep more strictly to a meat diet.

This was my position on the question of Vegetarianism at the time that I made my researches into the action of odorous matters, and published my theory of the Sanitary Woollen System. Here, again, troublesome doctrinism at once showed its hostility to what is practically good. The Sanitary Woollen System was vehemently attacked by the doctrinists of vegetarianism. This availed, however, as little as did the doctrinary assaults which were made from other quarters; the practical value of the system forced recognition, and not from the "omnivora" alone, but especially from vegetarians, in spite of the opposition of their doctrinary leaders; so that a year ago the admission was made in the vegetarian journal, the *Naturarzt*, that the Sanitary Woollen System had become a power which must be taken into account.

I have since been continually in contact, both personally and by correspondence, with vegetarians, luckily not with the doctrinists, but with common-sense, rational people, whose maxim is, "Examine everything and retain the best." From the communications I thus received, detailing personal practical experience, which I value higher than any doctrine, I arrived at the conviction that the doctrinal and the practical aspects of vegetarianism are not in congruity —that is to say that the vegetarian mode of life can show great practical results, but that the doctrinal foundation on which it rests is erroneous. These communications, together with my progressive knowledge respecting the nature of disease and cure, and the practical experience (now first fully comprehended) which I had with animals, as medical superintendent at the zoological garden, greatly changed my attitude towards vegetarianism, and assisted me to a different and, I believe, a more scientifically correct fundamental reason for the vegetarian mode of life.

My readers are acquainted with my maxim, "Disease is stench"—*i.e.*, everything mal-odorous either causes or disposes to disease, and this tendency is enhanced in proportion to the offensiveness of the odour. The cages in any zoological garden or menagerie afford ready proof that the excrement of carnivora is more offensive than that of frugivora. The manifold experience with dogs shows that this difference does not proceed from the specifically diverse natures of carnivora and frugivora, but from their diverse food. The exhalations from dogs, especially big dogs, which are fed with meat, are so offensive that the animals cannot be endured in a room; and it is an almost universal rule to

feed only watch-dogs with meat, and to restrict house-dogs to a vegetarian diet, *although such is not their natural diet.* It might be supposed that this unnatural nutriment would disagree with house-dogs, but precisely the reverse is the case: those (principally little dogs, whose exhalations are less perceptible) fed with meat are in no way healthier than those who are compulsory vegetarians; on the contrary, the former have a disposition to eruptive diseases, digestive complaints, inflammatory disorders, hemorrhoids, etc.

The popular expression for these well-known facts is that "meat is too heating for dogs;" and yet no one will dispute that dogs, as appertaining to the fox and wolf species, with similar formation of the teeth, intestines, etc., are naturally carnivorous. The explanation of this apparent contradiction is, that every creature has its so-called natural food, but so soon as it is withdrawn from its natural surroundings, and placed in a condition which is not natural to it, a change of diet is necessary. This is especially true of carnivora, but is also true of frugivora. It is well known, for instance, to cattle-breeders that hay is more wholesome for stalled cattle than green food, and yet the latter is the natural nutriment.

To man's physical nature the same laws apply as to that of the animals, as any one who is not already convinced can prove on his own person. The odour of the evacuations, as well as of the exhalations, is much less penetrating when the diet is vegetarian than when the body is nourished on meat. This I consider to be the reason of the undeniable success of the vegetarian mode of living in numerous cases

of illness, and to constitute its hygienic importance; for, as with the house-dog, so with most civilized men, they live within four walls, and are thus liable to be injuriously affected by their own exhalations in proportion as these are mal-odorous.

Vegetarianism therefore contends, although this has not hitherto been clearly perceived, with the same enemy that is attacked by the Sanitary Woollen System; and it was thus in the natural order of things that among vegetarians the System at once found enthusiastic adherents. The "noxious" emanations of the body were the impelling cause to vegetarianism, and some found therein a remedy for their complaints, while others, when the external and internal conditions were less favourable, experienced only alleviation; and these latter, with accurate instinct, adopted the Sanitary Woollen System as a means of perfecting their cure.

To the question whether, on the foregoing grounds, I recommend vegetarianism, I can reply neither in the affirmative nor the negative, for the following reasons :—

The suitability of a particular form of nutriment to man cannot be decided solely by the nature of the emanations which it evolves; the degree of its digestibility and of its nutritious quality must be taken into account. In these respects flesh foods, as a class, are distinctly superior to vegetable foods, although very fat meat is more difficult to digest than many kinds of fruit, and in point of nutritiousness legumes are very little inferior to meat; but on the whole the above statement holds good. When, therefore, the conditions of time or space require that the nutriment should be intensive, meat is

distinctly more effectual than a purely vegetable diet ; and most vegetarians have pratically admitted the inadequacy of the latter by adopting two of the most nourishing and easily digested animal foods—milk and eggs.

I therefore go thus far with vegetarianism :—For those who suffer from the evolution of the "noxious" emanations two courses are open, the Sanitary Woollen System and vegetarianism. Either or both may be chosen. I consider that vegetarianism is especially suited to the constitutions of people who lead indoor lives, and the lightness of whose occupation creates in the body a relatively small need of nourishment ; in short, people whose calling compels them to be idle indoors—as, for instance, persons who have frequently to wait in a condition of complete inactivity for orders from their chiefs, or those who have only light, uniform occupations, as copying, sewing, knitting, reading, etc.

On the other hand, I should dissuade those who work hard, physically or mentally, or who on other grounds require easily digestive intensive nutriment, both from a purely vegetarian mode of living, and from restricting their diet too exclusively to meat ; such persons require a mixed diet, and should adopt the Sanitary Woollen System.

Between the extremes of hard and light workers there will be many cases in which I can only give the advice both as to vegetarianism and the Sanitary Woollen System which I myself have always followed to advantage, "Examine everything, and retain the best." I have been reproached with riding an excellent principle to death, but my only principle is the foregoing maxim, and I admit that

I am willing to ride this at all times. My practice as a public teacher and adviser is not to recommend that which I and many others have recognised as the best, with a demand for unconditional acceptance and submission to my authority. I simply say, "Here is something which many have approved, and which is therefore worthy that others try it." I only ask that the trial shall be correct and thorough. This is my position in reference to the Sanitary Woollen System, and from this standpoint I have discussed vegetarianism.

THE POSITIVE AND NEGATIVE EFFECTS OF THE SANITARY WOOLLEN SYSTEM.

(1883.)

WHOEVER has read my publication on the subject must be well aware that I have never claimed for the Sanitary Woollen System that it is a universal remedy, or that it protects against every disease. As I find that the contrary is frequently asserted, I will now state what experience has so far shown that the Sanitary Woollen System will not do.

As regards the prevention of disease, a person who is suffering from any disorder, and who adopts the system, is not immediately enabled to resist the effects of weather, of infection, and of the emotions; the System must first aid the body to expel the disorder. Where the cure is not complete, the System distinctly increases the power of resistance

to the above-named influences, but cannot possibly make this perfect. If the cure be complete, then—and all experience, so far, confirms this—the resistance to influences of weather and temperature is exactly that which is possessed by the domestic animals, not greater and not less.

Respecting the power of resisting infection, I have constantly made the restriction that this does not apply equally to every kind of infection ; the so-called abdominal infectious diseases (cholera, typhus, dysentery) are those against which the Sanitary Woollen System principally protects. Against infectious diseases of the skin the System affords only a modified protection, and as regards its action in cases of *chronic* infectious disease, I have refrained from expressing any opinion.

This was my position from the first, and I have never swerved from it. Against some diseases the Sanitary Woollen System affords no protection ; I know that it has not availed against heart disease, nor against diabetes, as to the origin of which so little is yet ascertained. Of course, the System is powerless to prevent the evil effects of illness arising from the continued use of unwholesome food, or from inhaling poisonous vapours ; in other words, it does not protect the body against all diseases due to extraneous influences, but against the evil effects of its own "noxious" exhalations.

The remedial power of the Sanitary Woollen System may be summed up as follows :—

1. The Sanitary Woollen System cure runs its course similarly to all so-called constitutional cures —*i.e.*, which act upon the constitution. The necessity of expelling a disease through the secre-

tions of the body may give rise to "critical" symptoms, in the form of an acute attack of illness; and, as with all constitutional methods of cures, it may happen that the patient succumbs.

2. The complaints which have proved most readily susceptible to the remedial effects of the Sanitary Woollen System are precisely those which have been most obstinate when treated by the methods previously known. I refer to purely nervous disorders, next to which comes the group of catarrhal and rheumatic complaints. Of the more localized diseases of the internal organs the most susceptible to the System have been lung affections, including tubercles. Greater pertinacity is shown by diseases of the liver, and by many, although not by all, diseases of the kidneys (diabetes resists the System, which also seems unable to prevent it). The System prevents chlorosis, but will not cure it, although rendering it more capable of being cured.

Lastly, the tonsils resist the remedial power of the Sanitary Woollen System, and as the delicacy of these organs constitutes, in my own case, the obstacle to my attainment of constant equable health, I will treat of them somewhat more in detail.

Just as certain natural cyclic bodily incidents are repeated at regular periods, so there are some cyclic disorders, which, without any apparent cause, recur at more or less fixed intervals, and which are further distinguished by the circumstance that they are hereditary. The most characteristic of this class of complaints is inflammation of the tonsils, a tendency to which was transmitted to me by my mother, while two of my children inherit it from

me. As a rule, this inherited tendency is first revealed on the entrance into puberty, and such was the case with myself and my two children. After that age I suffered every winter from an acute attack of inflammation of the tonsils or the throat.

Since I have adopted the Sanitary Woollen System the complaint is no longer of an inflammatory nature, and has assumed a catarrhal form, which I ascribed partly to the incomplete carrying out of the System during the course of its development, and partly to external injurious influences, such as the condition of the atmosphere, etc. I was curious as to what would be the experience of last winter, the first in which I had carried out the System in its entirety. This thoroughness notwithstanding, the complaint returned at the usual period, without tangible cause, so that I now look upon it as the remainder of an inherited tendency to cyclically recurrent inflammation of the tonsils.

This winter the attack was unprecedentedly mild, so much so that it did not prevent me, in February, on the occasion of a visit to Dresden, from speaking, with only one hour's interruption, incessantly from 2 p.m. to 4 a.m.; at 9 a.m. I resumed discussion, my voice being quite unaffected, until 6 p.m., and again, in the train, from 2 to 7 in the early morning. Another week I spoke on the Monday for eight and a half hours; on the Thursday for seventeen hours, with an interruption of two and a half hours; on the Friday for nineteen hours, without interruption. During this time my voice was husky, and occasionally hoarse, but it sustained no injury from the unusual exertion. I may add,

that my total allowance of sleep from the Monday to the Saturday was twenty-five hours.

My two children who have inherited this delicacy of the tonsils from me also felt none of its effects until they reached the age of puberty, when in one case it took the form of an affection of the tonsils and larynx, with feverish symptoms, but soon changed into chronic hoarseness, free from all fever; in the other case there was from the first an entire absence of feverish symptoms, as is now the case with myself.

Another of my children, who arrived at adult years some time ago, was similarly troubled during the period of youth, but has long been free from the disorder. This proves that in the cases of myself and my two children, who first suffered from this complaint when we were adolescent, the cause does not lie in a faulty mode of living, and is too deeply implanted in the constitution to be prevented or cured by any particular system.

VEGETABLE FIBRE, WHEN AND WHY UNSANITARY.

(1884.)

The sanitary objections to materials of vegetable fibre are patent from the following facts:—

1. Every sick person gives forth a mal-odorous exhalation; a proof of this is afforded in the attraction of flies, which are allured by matter which has become mal-odorous.

2. An offensive atmosphere, especially when it

has become so through human exhalations, is a well-known cause of illness.

3. Bacteria are "koprophilous" parasites, which multiply in solutions of offensive-smelling nutriment.

4. *Living* plants are "koprophagous," attracting all evil odours, and assimilating them. The effect of vegetation in purifying the air has long been recognised.

5. *Dead* vegetable fibre has a similar power of absorbing evil odours; as, however, it cannot *assimilate* them, the ordinary laws of gas-absorption prevail, *i.e.*, the absorption is greatest under conditions of cold, and the odours are again exhaled when the fibre is warmed or wetted. Clothing, bedding, and generally all material of vegetable fibre, while cold (*i.e.*, not in use), and when placed in the atmosphere of human beings, attract the mal-odorous exhalations until no more can be absorbed; as soon as such clothing, bedding, etc., comes in contact with the warm body, these emanations are given off in proportion to the degree of temperature. This directly induces spasmodic action of the capillaries of the skin (feeling of chill), and the atmosphere breathed is corrupted. Both effects are intensified when the fibre is damp; wet unvarnished or unpainted wooden floors, and damp linen or cotton shirts, or bedding are notoriously dangerous to health.

6. Just as living animal substance, when at rest, stores up oxygen, so, under similar conditions, it stores up the noxious emanations proceeding from the digested food; but while the chlorophyll of living vegetable fibre assimilates such emanations, the living animal substance does not possess that

faculty. These noxious emanations therefore readily become disengaged in the body, especially when there is excessive internal heat, and permeate the tissues and juices, inducing similar phenomena to those caused by the direct inhalation of mal-odorous air, viz., spasmodic action of the capillaries of the skin, with feverish shivering while the spasms last; further, the insufficient throwing off by the skin of the internal warmth is felt, when the spasms subside, as febrile heat on the surface. The retention of the noxious emanations which proceed from the digested food is thus tantamount to disposition to feverish sickness.

7. The retention of the emanations which proceed from the digested food also gives rise to the so-called ferment diseases, as they impart to the juices of the body the fœcal taint which these "koprophilous" ferments require.

8. Whoever, therefore, uses clothing, bedding, and materials of vegetable fibre not sanitarily treated, is continually exposed to the danger involved by the retention of the emanations from the digested food; and this danger is avoided so soon as use is made of animal fibre only, or of such vegetable fibre as has been impregnated with fatty or resinous matter (in short with matter which is not soluble in water), and has thus been rendered incapable of absorbing evil odours.

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